# UNITED STATES AIR FORCE WEAPONS SCHOOL F-16 DIVISION REVISED FLYING AND ACADEMIC SYLLABUS FLOW

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE
General Studies

by

CHRISTOPHER P. WEGGEMAN, MAJ, USAF
B.S., Purdue University, West Lafayette, Indiana, 1987

Fort Leavenworth, Kansas
1999

# REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188



| 1. AGENCY USE ONLY (Leave blank) | 2. REPORT DATE | 3. REPORT TYPE AND DATES COVERED |
|---|---|---|
| | 4 Jun 99 | Master's Thesis 7 Aug - 4 Jun 99 |

4. TITLE AND SUBTITLE
United States Air Force Weapons School, F-16 Division, Revised Flying and Academic Syllabus Flow

5. FUNDING NUMBERS

6. AUTHORS)
MAJ Christopher P. Weggeman, USAF

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army command and General Staff College
ATTN: ATZL-SWD-GD
1 Reynolds Av., Bldg. 111, Rm. 123
Ft. Leavenworth, KS 66027-1352

8. PERFORMING ORGANIATION REPORT NUMBER

9. SPONSORING/ MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE
A

13. ABSTRACT (Maximum 200 words)
This study investigates the potential benefits associated with altering the flow in which the F-16 Division (WSF) of the USAF Weapons School executes their flying and academic syllabus. It analyzes the potential for increased instructional quality within the F-16 Division as a result of syllabus flow alterations.

The F-16 Division of the USAF Weapons School currently executes two twelve-man student classes per calendar year. Their mission is to produce weapons instructors who possess the knowledge and skills necessary to provide weapons and weapons-related systems, and tactics expertise at the squadron, wing, and headquarters level. These graduates are highly trained in communications skills and effective instructional techniques both in the academic and flying environment. They are well versed in the structure and policies of the Combat Air Force and can interface with all elements to bring about effective combat ready forces.

This study analyzes the current F-16 Division flying and academic syllabus flow for training and instructional shortfalls. It proposes a revised flying and academic syllabus flow designed to increase student learning, reduce student-based attrition, increase flying event continuity, and maximize student academic retention and application throughout its execution. These benefits are necessary given the comprehensive nature of the F-16 Division's mission, their finite training cycle allotment, and the ever-increasing repertoire of F-16 weapons systems and missions.

14. SUBJECT TERMS
USAF Weapons School F-16 Division flying Syllabus. Flying syllabus execution. Flying Proficiency. Flying continuity. Improved instructional quality. Reduced attrition. Night flying schedules. Academic syllabus execution

15. NUMBER OF PAGES
79

16. PRICE CODE

| 17. SECURITY CLASSIFICATION OF REPORT | 18. SECURITY CLASSIFICATION | 19. SECURITY CLASSIFICATION OF ABTRACT | 20. LIMITATION OF ABSTRACT |
|---|---|---|---|
| UNLCASSIFIED | UNCLASSIFIED | UNCLASSIFIED | UL |

MASTER OF MILITARY ART AND SCIENCE

THESIS APPROVAL PAGE

Name of Candidate: Major Christopher P. Weggeman

Thesis Title: United States Air Force Weapons School, F-16 Division Revised Flying and Academic Syllabus Flow

Approved by:

__________________________________, Thesis committee Chairman
Major Kenneth S. Rosson, M.S.

__________________________________, Member
Lieutenant Colonel Charles C. Floyd, M.M.A.S.

__________________________________, Member, Consulting Faculty
Colonel David H. Vaughan, Ph.D.

Accepted this 4th day of June 1999 by:

__________________________________, Director, Graduate Degree Programs
Philip J. Brookes, Ph.D.

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

## ABSTRACT

UNITED STATES AIR FORCE WEAPONS SCHOOL, F-16 DIVISION REVISED FLYING AND ACADEMIC SYLLABUS FLOW by MAJ Christopher P. Weggeman, USAF,73 pages.

This study investigates the potential benefits associated with altering the flow in which the F-16 Division (WSF) of the USAF Weapons School executes their flying and academic syllabus. It analyzes the potential for increased instructional quality within the F-16 Division as a result of syllabus flow alterations.

The F-16 Division of the USAF Weapons School currently executes two twelve student classes per calendar year. Their mission is to produce weapons instructors who possess the knowledge and skills necessary to provide weapons and weapons-related systems, and tactics expertise at the squadron, wing, and headquarters level. These graduates are highly trained in communications skills and effective instructional techniques both in the academic and flying environment. They are well versed in the structure and policies of the Combat Air Force and can interface with all elements to bring about effective combat ready forces.

This study analyzes the current F-16 Division flying and academic syllabus flow for training and instructional shortfalls. It proposes a revised flying and academic syllabus flow designed to increase student learning, reduce student-based attrition, increase flying event continuity, and maximize student academic retention and application throughout its execution. These benefits are necessary given the comprehensive nature of the F-16 Division's mission, their finite training cycle allotment, and the ever-increasing repertoire of F-16 weapons systems and missions.

TABLE OF CONTENTS

CHAPTER Page

## ABBREVIATIONS

| | |
|---|---|
| AAWE | Air-to-Air Weapons Employment |
| ACC | Air Combat Command |
| ACM | Air Combat Maneuvering |
| ACT | Air Combat Tactics |
| BFM | Basic Fighter Maneuvers |
| BVR | Beyond Visual Range |
| CAF | Combat Air Force |
| CAS | Close Air Support |
| CT | Continuation Training |
| DCA | Defensive Counter-Air |
| FAC-A | Forward Air Controller-Airborne |
| FP | Force Protection |
| FW | Fighter Wing |
| HARM | Hi-Speed Antiradiation Missile |
| HTS | Harm Targeting System |
| IADS | Integrated Air Defense System |
| IDA | Institute for Defense Analysis |
| IP | Instructor Pilot |
| IPUG | Instructor Pilot Upgrade |
| LGB | Laser-Guided Bomb |
| ME | Mission Employment |

| | |
|---|---|
| NVG | Night Vision Goggles |
| OCA | Offensive Counter-air |
| PID | Positive Identification |
| SA | Surface Attack |
| SAT | Surface Attack Tactics |
| SEAD | Suppression of Enemy Air Defenses |
| TGP | Targeting Pod |
| TI | Tactical Intercepts |
| USAFWS | United States Air Force Weapons School |
| VID | Visual Identification |
| WPNs | Weapons |
| WS | Weapons School |
| WSF | F-16 Division, USAFWS |

## ILLUSTRATIONS

# CHAPTER 1

# INTRODUCTION

## Background

Since its establishment in 1949 the United States Air Force Weapons School (USAFWS)--Fighter Gunnery School as it was named back then--has provided higher-level education and instruction to America's best fighter pilot instructors. The current institution consists of twelve functional divisions representing the majority of USAF aircraft and weapons systems. The USAFWS's divisions include: A-10, F-15C, F-16C, F-15E, B-1, B-52, HH-60, C-130, Command and Control, Space, and Intelligence systems. The focus of this thesis is within the F-16 Division (WSF) of USAFWS, which graduated its first class in May of 1978. Since its inception, the F-16 Division has nearly doubled its flying and academic syllabus from three months with twenty-one sorties to the current syllabus of just under six months with thirty-nine sorties (USAF Weapons Instructor Course F-16 1997). As with any educational institution, WSF continues an ongoing evolution within its syllabus designed to integrate the abundance of newly emerging technologies and missions for the multirole F-16. While tailoring their syllabus to meet the demands of operational growth, they must keep in focus the purpose of the F-16 Division. The WSF mission is to ensure that: "The WS graduate possesses the knowledge and skills necessary to provide weapons, weapons related systems, and tactics expertise at the squadron, wing and headquarters level." Furthermore, "the graduate is highly versed in communication skills and effective instructional techniques both in the

academic and flying environment. They are familiar with the structure and policies of the Combat Air Force (CAF) and can interface with all elements to help bring about effective combat ready forces" (USAF Weapons Instructor Course F-16 1997, 14-15).

## Research Questions

Being charged with such a critical and comprehensive mission, the F-16 Division constantly reevaluates the content of its flying and academic syllabus to improve the instructional prowess within its graduates. This ongoing syllabus review is crucial to keeping up with rapid advancements within F-16 technologies and tactics. It must be completed in a way which optimizes learning and instruction during its execution. The framework, organization, and event flow of the F-16 syllabus must be scrutinized and revised as an integral part of every syllabus revision. This statement forms the premise for this thesis primary question, Can establishing a phase-based instructional framework while optimizing the order in which the F-16 Division executes its flying and academic syllabus improve the instructional quality of the institution? Supporting this argument, the thesis will also address these additional questions:

1. Does changing the phase flow and framework create greater learning opportunities for the student?
2. Can altering the phase flow reduce attrition and preserve continuity in perishable F-16 employment skills?
3. Does executing all F-16 night employment missions in a single night-phase instructional block increase student learning?

4. Can altering the flow of the F-16 academic syllabus courseware increase student learning and retention?

The framework within which WSF executes its syllabus and the order it accomplishes its syllabus are integral parts of the content, contributing directly to the quality of instruction provided and to WSF mission accomplishment. From an instructional standpoint, the importance of optimizing the framework and the flow of the WSF syllabus is somewhat obvious, but there are other significant reasons for this proposal.

As WSF's syllabus continues to grow and change with the addition of new systems and missions for the F-16, the timeframe in which it accomplishes its critical mission remains finite. WSF constantly struggles to fulfill all syllabus requirements within the training period, often overburdening its instructors and students along the way.

The WSF Syllabus allocates ninety-eight training days by Air Combat Command (ACC) to graduate a given class. The current number of students per class is twelve; this number does fluctuate based upon WSF capability, CAF needs, and the pool of qualified applicants. In the 98 training days, WSF currently puts each student through 39 flying missions and over 330 hours of academic instruction, often to the detriment of the student (USAF Weapons Instructor Course F-16 1997). One can easily assume that this training equates to 468 flying sorties per class (12 students x 39 missions), which is a planning constant. However, the number of sorties is not constant due to sortie attrition.

Sortie attrition includes student syllabus missions that are incomplete or non-effective for a variety of reasons. The most damaging of which is student-based attrition,

or the failure of a student to meet syllabus standards on a mission. Although a historical attrition rate is programmed into the flying syllabus timeline, it is usually insufficient when combined with other attrition factors beyond WSF's control. These include weather, maintenance, aircraft malfunctions, ACC down days, training days, and 57th Fighter Wing (FW) mandated no-fly days. These compounding factors compete for time during the ninety-eight training days allotted, making it increasingly more difficult to graduate the qualified students on time or add new missions and taskings. Also, if the student class size is increased, the problem only becomes more difficult. This problem creates the need to reduce student-based attrition while maintaining course standards. This thesis argues that by optimizing the WSF syllabus flow, preserving student flying continuity and proficiency, that student learning will improve and student-based attrition will decline. When student-based attrition is reduced, WSF has increased flexibility in accomplishing its mission. This also creates room for division instructor pilot upgrade (IPUG) sorties, WSF IP continuation training (CT) missions, future syllabus additions, or increased class size if needed. Now, with the relevance of this thesis established, some key terms and assumptions inherent to its solution must be understood.

## Assumptions

This thesis is written under the following assumptions:

1. The reader is an F-16 IP, with an understanding of the WS mission and WSF syllabus. For inferences towards generic USAF flying and academic syllabi, the reader need only be an IP in his or her weapons system.

2. The research conducted was applied to the current ACC-approved WSF syllabus, based on twelve-students per class, historical attrition rates, and BIF calendar class flow.
3. The contents of syllabus missions or academic courses were not changed.
4. Flying syllabus flow changes do not consider WSF's maintenance workload concerning aircraft configuration changes and aircraft generation.
5. The midcourse deployment to Tyndall Air Force Base for Air to Air Weapons System Employment Program (WSEP) remains unchanged.

## Key Terms and Definitions

The current WSF flying syllabus is comprised of thirty-nine flying missions. Each mission is aligned into one of eleven phases of execution: Basic Fighter Maneuvers (BFM), Air Combat Maneuvering (ACM), Tactical Intercepts (TI), Air Combat Tactics (ACT), Air-to-Air Weapons Employment (AAWE), Surface Attack (SA), Surface Attack Tactics (SAT), Close Air Support (CAS), Weapons (WPN), Force Protection (FP),and Mission Employment (ME). Detailed specifics of each mission or phase are given in the current ACC USAFWS/WSF Syllabus dated July 1997. Flying phases and their respective missions are aligned in a building-block approach from course start to course finish. Phases with respective night employment missions include TI, SA, SAT, CAS and WPNs. New to this proposal is the term "instructional block," in which the current syllabus phases are aligned. An instructional block is a course of training focused on teaching the instruction and execution of a specific set of employment skills in the F-16.

The three instructional blocks within the revised syllabus framework are the instruction of:

1. F-16 Mission Fundamentals
2. F-16 Night Employment
3. F-16 Combat Mission Execution

Each mission within these blocks has a mission briefing, typically lasting fifty minutes to one hour. Briefings are labeled either "Instructional," meaning: that instruction is provided throughout to facilitate mission accomplishment, or "Go to War," meaning that the briefing covers mission execution and contingency specifics only. Mission planning, debrief, and analysis are always instructional in format. As mentioned previously, the proposed syllabus flow is designed to reduce student-based attrition, by maximizing student proficiency. These and additional terms are defined as follows:

Flying Continuity: A measure of the down-time between flying repetitive or related missions or executing a specific set of tactical employment skills.

Scheduling Effectiveness: A numerical representation of lost student sortie opportunities. A mission requiring one instructor sortie per student sortie and flown as such has a 100 percent scheduled effectiveness. A syllabus directed four-ship mission, with the same one-to-one instructor-student requirement, flown with three instructors and only one student, instead of two, has a scheduling effectiveness of 50 percent since only one-half of the potential student sorties available were flown (USAF Weapons Instructor Course F-16 1997). This inefficiency occurs when there are not enough students available to fill the scheduled missions. Student-based attrition creates this dilemma.

Students on busts must refly that mission, so they are not available to progress and fill the scheduled subsequent ride with their classmates.

Student-Based Attrition: A Noneffective (NE) mission caused by the failure of a student to meet syllabus standards, commonly referred to as "Busts" or "Busted rides." Typically managed and planned for using a historical percentage increase of scheduled missions for a phase (USAF Weapons Instructor Course F-16 1997). An example is provided using the BFM phase:

5 mission BFM Phase x 12 students = 60 missions required by the syllabus

BFM historical attrition of 25% = 15 additional missions scheduled

60 required + 15 attrition = 75 BFM missions scheduled

Student Proficiency: A relative term expressing a student's current aptitude and ability at executing a specific F-16 employment skill.

## Constraints and Limitations

There is one major constraint and limitation to address in the development of this thesis. First is the limitation of designing and executing the revised syllabus flow within the ACC allotted ninety-eight training day window, specifically, executing the new syllabus flow within the proposed instructional blocks while preserving WSF's existing calendar flow for the syllabus.

Unfortunately, WSF is not in a position to ask ACC for a reduced class size, additional funding, or more training days. Conversely, operational commanders and

current operational tempo demands more Weapons School graduates than the institution currently produces. Therefore, all proposed syllabus flow changes within this thesis are limited to, and designed within, the existing BIF calendar class flow. The limitation lies within the quantification of proof of the arguments in this thesis.

Systematically proving the merits of this thesis is a challenge. Collecting data on concepts, such as improved learning and instructional quality, is difficult, but not impossible. The data collected provides a measurable justification for implementing the proposed syllabus flow. Without the results of its execution, the thesis is limited to conceptual proof only. However, the goal of this thesis is the implementation and execution of the proposed WSF syllabus, establishing concrete proof of its merits. Before proceeding directly to the proposed revised syllabus, some background information is presented lending insight to the existing research and literature related to this thesis.

# CHAPTER 2

# LITERATURE REVIEW

The literature review for this thesis revealed only a few existing articles and papers with relevant subject matter. Several pieces of literature exist concerning syllabus content for training fighter aircrews, but few contained subject matter relevant to syllabus execution. This was expected given the highly specialized and specific nature of the research questions. The literature reviewed relates specifically to the following areas of research for this thesis: (1) flying hour continuity and aircrew performance and (2) activity and rest patterns during rapid transitions from day to night flying schedules.

The first subject of flying hour continuity and aircrew performance is discussed in two separate papers. First is the Institute for Defense Analysis (IDA) paper from December of 1987 titled *Relating Flying Hour Activity to the Performance of Aircrews.* This paper quantified the short-term and long-term effects of flying hour changes on aircrew proficiencies in tactical events using a multiple regression model. The model used such factors as accumulated flying time, number of events flown in a given time period, and elapsed time between events to formulate its conclusions. The paper demonstrated a direct link between recent flying experience and aircrew performance in air-to-air and air-to-ground missions (Horowitz, Hammon, and Palmer 1987). This proves relevant to this thesis and its attempt to preserve perishable flying event continuity within the WSF syllabus. The IDA paper shows that if flying hour continuity is maintained aircrews will perform better in their assigned mission tasks (Horowitz,

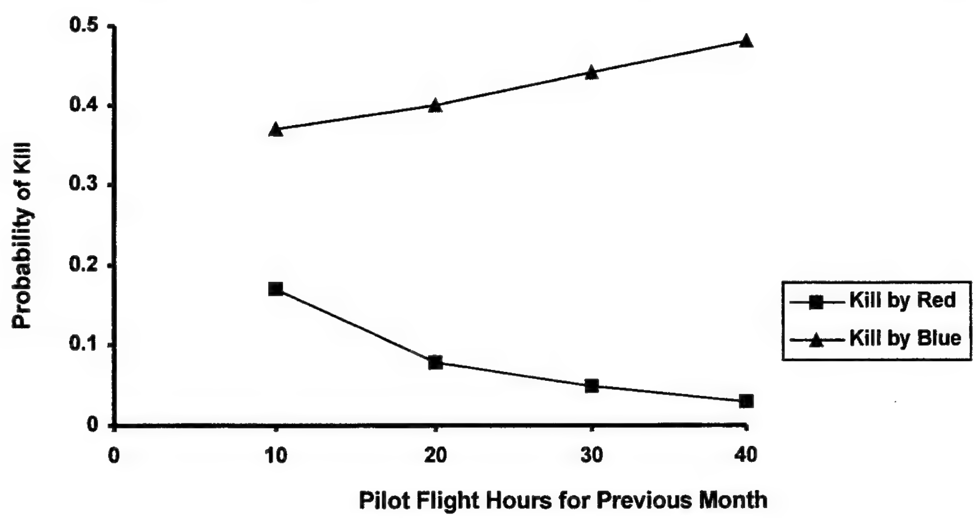
Hammon, and Palmer 1987). This concept demonstrates a large potential for a reduction in student-based attrition (increased aircrew performance) on missions requiring perishable air-to-air employment skills. The research also showed that as total flying experience increased, an aircrew required less flying time to rehone their skills. Also that aircrews with greater total flying experience retained tactical skills longer before showing signs of regression (Horowitz, Hammon, and Palmer 1987). Since WSF student flying experience is relatively similar due to course entry requirements and age limitations, these factors remain relatively constant and have little impact to this thesis.

The second paper was prepared for the Office of the Assistant Secretary of Defense, Force Management and Personnel, and is also published by the IDA. This paper *Flying Hours and Aircrew Performance* addresses very similar issues. The paper focuses specifically on air-to-air skills of Navy fighter pilots flying in simulated air-to-air combat scenarios. It also finds a direct link between aircrew performance in air-to-air combat and the number of hours pilots have flown, both recently (continuity) and over the course of their careers (Hammon and Horowitz 1990).

Figure 1 depicts the findings of the IDA studies done on the effects of decreased flying continuity on air-to-air combat mission results. The results quantified are the engagement outcomes of each air-to-air pass. Blue air kills represent a positive result for the study, and Red air kills represent a negative trend in performance. As shown, a decrease in flying continuity caused a reduced probability of Blue air kill and an increased probability of being killed by Red air. Specifically, the research shows, that for every 10 percent reduction per month in flying hours, there was a 9 percent increase in

the probability that Red air kills Blue air and a 5 percent reduction in the probability Blue air kills Red air (Hammon and Horowitz 1990). This research also demonstrates a direct relationship between flying hour continuity and aircrew performance, specifically air-to-air combat mission employment. For the purpose of this thesis, this also shows how preserving flying event continuity should improve student results on air-to-air sorties, reducing attrition from student failure to meet syllabus standards pertaining to air-to-air engagements. Other factors of student attrition on air-to-air missions, such as mission briefings and debriefings, are not researched in this IDA study. Next is a review of the second relevant research study discovered during the literature review: activity and rest patterns during rapid transitions from day to night flying schedules.

**RECENT FLYING HOURS AND PERFORMANCE IN AIR-TO-AIR COMBAT**




Source: Hammond and Horowitz, p. 24.

Figure 1

The United States Army Aeromedical Research Laboratory conducted a research study in 1993 entitled *Activity/Rest Patterns of Instructor and Rated Student Pilots During Rapid Transitions from Daytime to Nighttime Duty Hours at the Eastern Army Aviation Training Site*. This research study analyzed the effects on aircrew rest cycles (rest duration, average bedtime, and average rise time, sleep loss, and fatigue) for Army Blackhawk aircrews alternating between daytime and nighttime training schedules. The study analyzed the effects of rapid schedule transitions on both locally based IPs, and rated student pilots living on post in temporary quarters. This facet of the study is significant since the WS situation is the same, with locally based WS instructors and rated student pilots living on post in temporary quarters.

The study concludes that rapid short-duration transitions from daytime flying to nighttime flying did not allow IPs to adequately adjust rest cycles and preserve their normal average rest durations. The research concluded that rated student pilots better preserved their rest cycles, as long as their rise times were delayed, compensating for the night-flying delayed bedtimes. The study revealed that IPs' rest cycles recovered when night-flying schedules remained in place for four or more consecutive days when IPs' rise times were effectively delayed. The rest-cycle recovery was attributed to a shift in the IPs' circadian rhythm over the longer duration night schedule (Comperatore et al. 1993).

The study specifically shows that IPs had a greater decrease in average rest duration than rated student pilots. This was attributed to a delayed (later) bedtime from the night-flying schedule, followed by a subsequent inability to delay rise time (sleep-in) to compensate. The study found that married IPs all lived at home during the training.

The IPs' home environment rise time was found to be influenced by the households normal daily family routine, especially for IPs with children. Also, that normal IPs' duty days often include official and or private activities requiring early morning awakening. The rated student pilots, however, preserved their average rest duration much better (Comperatore et al. 1993).

The rated student pilots effectively delayed morning rise times offsetting their later bedtime, preserving overall rest during night-flying cycles. The research concluded that temporary lodging facilities and the absence of family interference made this possible. Also the students daily schedule of classes was conducive to the maintenance of a consistent daily routine (Comperatore et al. 1993).

The study also concluded that IPs better adapted to night schedules when they continued longer than four days with delayed rise times. IPs' rest durations eventually increased when the night cycle continued without rise time adjustments, but caused by IPs' fatigue and exhaustion from cumulative sleep deprivation. This fatigued condition is very dangerous for aircrews performing flying duties, especially at night. The study showed the preferred method of adjusting to night schedules was through greater-duration, night-flying cycles with delayed rise times, causing desired circadian rhythm shift in IPs. These longer duration exposures to night flying enabled the pilots to properly adjust their circadian rhythms. The study recommended a number of practical countermeasures useful to IPs in preventing sleep loss and fatigue during frequent transitions from daytime to nighttime duty hours (Comperatore et al. 1993).

These countermeasures included delayed bedtimes and subsequent delayed rise times throughout the training period. The study recommends that IPs make arrangements and adjustments in family and household activities to facilitate this shift. The later sleep-wake cycle must be maintained over weekends if training carries over into subsequent weeks. Duty day report times must also shift, at a minimum in accordance with current night-flying regulations, with even greater delayed report times better. IPs should be encouraged to nap during late afternoon and evening to minimize the performance effects of sleep loss during night flights. The research concluded that late afternoon and early evening naps are very helpful in facilitating the adaptation to late bedtimes occurring between 0100 and 0300 hours. The study ultimately concludes that schedules must minimize short-duration shifts to night flying, less than three days, and recommends a maximum-duration night schedule of two weeks (Comperatore et al. 1993).

The study states that some individuals will experience more difficulty adapting to nighttime duty hours for long periods of time, while others will prefer longer duration night shifts. Since age, family status, and health will affect individual choices, scheduling two-week, night-shift periods best suits both preferences (Comperatore et al. 1993).

This study's conclusions directly apply to problems within the current WSF night-flying schedules for instructors and students. It sheds light on the inherent difficulties IPs have with frequent and rapid shifts in day/night flying schedules. The study's recommendations are incorporated into this thesis's proposed night-flying instructional block.

The literature review revealed relevant research concerning flying hour continuity and air-to-air flying skills, and the effects of rapid shifts from day- to night-flying schedules on aircrew rest. The literature review did not reveal any past research relating flying syllabus flow or execution to flying course instructional quality. All searches into flying training programs and syllabi revealed literature concerning current flying regulations, training cycle content, and or training requirements for current and future systems. This thesis attempts to fill the void and expand the database to include flying and academic syllabus execution as a means of optimizing student learning. Next an in-depth look at the current WSF flying and academic syllabus structure and flow, discussing inherent strengths and weaknesses as they pertain to this proposal.

# CHAPTER 3

# CURRENT SYLLABUS REVIEW

This chapter provides an in-depth look at the current WSF flying and academic syllabus. It identifies and quantifies existing problems within its execution. Specifically, it examines the following:

1. Current flying syllabus building-block phase flow
2. High-attrition phases
3. Flying proficiency gaps in perishable air-to-air skills
4. Night-flying mission schedules

On the academic side of the house this chapter reviews the existing academic course flow, demonstrating the misalignment of specific syllabus academic subject matter to flying syllabus missions. It concludes with a description of the primary research tool used in gathering information and data relevant to the design and implementation of this proposal.

## Current Flying Syllabus Building-Block Phase Flow

The current syllabus executed by the F-16 Division is Air Combat Command (ACC) Syllabus, Course No. F1600ID0PN, titled *USAF Weapons Instructor Course F-16, July 1997*. This ACC approved syllabus is reviewed and revised annually in accordance with ACCI 36-2252. The F-16 Division leadership and instructors are involved in all annual revisions. The syllabus describes in detail Course Accounting (description and inventory), Course Management (training standards, course flow),

Academic Training (academic course flow and content), Device Training (Weapons Task Trainer flow), and Flying Training (flying mission descriptions and standards). Figure 2 illustrates the current flying syllabus, in order of mission execution, broken down by flying phase, sorties per phase, historical attrition, mission synopsis and briefing type (USAF Weapons Instructor Course F16 1997).

Figure 2 shows the current WSF flying syllabus phase flow starting with BFM and ending with Mission Employment (ME). The current phase flow design creates a building-block approach to student instructional training. Its intent is to train students using a "walk-before-you-run" concept. Missions are flowed out within their respective phases by order of complexity in execution. Included within each phase of flying instruction, except Surface Attack, is an instructor demonstration sortie prior to any student led sorties in that phase. These "IP Demos" are designed to show students proper instructional methods and techniques used in planning, briefing, executing, and debriefing a typical mission for that phase (USAF Weapons Instructor Course F16 1997). The current WSF flying phase concept provides solid, instructionally sound methods for executing syllabus sorties. What it lacks is a more-focused framework for phase execution and mission flow.

The current phase flow alternates between instruction of F-16 mission fundamentals and instruction of F-16 employment in full-up go-to-war scenarios. Specific examples of this are the transitions from ACT to SA, SAT to CAS, and CAS to Weapons. The current phase flow utilizes a logical building-block phase progression.

## WSF FLYING SYLLABUS QUICK LOOK

| Mission | Phase | Historical Attrition | Mission Synopsis | Brief Type |
|---|---|---|---|---|
| BFM-1 | **BFM** | **30%** | IP Led (IPL) Offensive BFM | Instructional |
| BFM-2 | | | Student Led (SL) Offensive BFM | Instructional |
| BFM-3 | | | IPL Defensive BFM | Instructional |
| BFM-4 | | | SL Defensive BFM | Instructional |
| BFM-5 | | | IPL Hi-Aspect BFM | Instructional |
| BFM-6 | | | SL Hi-Aspect BFM | Instructional |
| ACM-1 | **ACM** | **10%** | IPL 2 V 1+ 1 ACM | Instructional |
| TI-1 | **TI** | **25%** | IPL 1 V 2 Intercepts (VID v BVR) | Instructional |
| TI-2 | | | SL 2 v 4 Intercepts (VID v BVR) | Go to War |
| TI-3 | | | IPL 2 v 4 Intercepts (PID v BVR) | Instructional |
| TI-4 | | | IPL 4 v 4 Intercepts (PID v BVR) | Instructional |
| TI-5 NIGHT | | | SL 2 v 2 Night Intercepts (PID v BVR) | Go to War |
| ACT-1 | **ACT** | **30%** | IPL 4 v X (VID v BVR Radar Thrx) | Go to War |
| ACT-2 | | | SL 4 v X (VID v VID Heat Thrx) | Go to War |
| ACT-3 | | | SL 4 V X (VID v BVR Radar Thrx) | Go to War |
| ACT-4 | | | IPL 4 v X (PID v BVR Point Defense) | Go to War |
| ACT-5 | | | SL 4 V X ( PID v BVR Point Defense) | Go to War |
| AAWE-1 | **AAW E** | **5%** | IPL Live A/A Missile employment | Instructional |
| AAWE-2 | | | IPL live A/A gun employment | Instructional |
| SA-1 | **SA** | **15%** | SL 2 ship basic surface attack | Instructional |
| SA-2 | | | IPL 4-ship IR employment (MAV/LGB) | Instructional |
| SA-3 | | | IPL 4-ship HTS HARM employment | Instructional |
| SA-4 | | | IPL 2-ship Night IR employment (MAV) | Instructional |
| SAT-1 | **SAT** | **15%** | IPL 2-ship Air to Surface Tactics | Instructional |
| SAT-2 | | | IPL 4-ship SEAD-DEAD employment | Instructional |
| SAT-3 NIGHT | | | IPL 2 ship Night LGB Tactics | Instructional |
| CAS-1 | **CAS** | **20%** | IPL 4-ship reduced threat CAS | Instructional |
| CAS-2 | | | SL 2-ship high threat CAS | Instructional |
| CAS-2A | | | SL 2-ship high threat FAC-A | Instructional |
| CAS-3 | | | SL 2-ship night reduced threat CAS | Instructional |
| CAS-3A NIGHT | | | SL 2-ship night reduced threat FAC-A | Instructional |
| WPN-1 | **WPNS** | **25%** | IPL 4 V X Strategic Attack mission | Go To War |
| WPN-2 | | | SL 4 V X OCA SEAD (Conventional) | Go To War |
| WPN-3 | | | SL 4 V X SEAD-HTS | Go To War |
| WPN-4 | | | SL 8 V X OCA | Go To War |
| WPN-5CG NIGHT | | | SL 4 v X Night OCA (Flown in conjunction with WPN-5CJ) | Go To War |
| WPN-5CJ NIGHT | | | SL 4 v X Night SEAD-HTS (Flown in conjunction with WPN-5CG) | Go To War |
| WPN-6 | | | SL 4 v X Strategic Attack (12-ship in conjunction with FP-1CG and FP-1 CJ) | |
| FP-1 CG | **FP** | **30%** | SL 4 V X (PID v BVR Force Protec.) | Go to War |
| FP-1 CJ | | | SL 4 V X (HARM-HTS) | Go to War |
| ME 1 THROUGH 3 | **ME** | **10%** | | |

Figure 2

Phases are arranged by those containing similar and related skills, and culminate in combat mission execution phases. An example of this phase flow is: BFM, ACM, TI, and ACT (USAF Weapons Instructor Course F16 1997). However, this constant change in student and instructor mission preparation and focus often leads to student confusion and more difficult mission preparation. The Brief Type column of figure 2 illustrates a facet of this problem.

When briefing formats for a given mission change within a phase from instructional, to go to war, so too do all planning, briefing, executing, and debriefing standards. The entire mission planning, briefing, and in-flight execution are altered to fit the instructional or go-to-war context. Student comments on various end-of-phase critiques state contention with constant swapping between mission formats and standards as well as the need for additional IP demos if both formats are required in a phase (96 AIF TI and SAT Phase Hotwash 1996). Instructors also balk at problems associated with this design. A personal interview with the then current division's operations officer discussing this problem revealed concern for the instructors' ability to provide, "focused and quality instruction when you're constantly switching gears between giving an instructional demo, and helping a student build a go-to-war brief and gameplan" (Moore 1998). The operations officer went on to agree that in keeping with the division's long-running, building-block design, it only makes sense to provide students with the required mission employment fundamentals first, through instructional phases, then when students have mastered these instructional fundamentals, begin challenging them with F-16

combat mission execution in dynamic advanced scenarios (Moore 1998). The second current flying syllabus issue concerns the flow of high-attrition phases.

## High-Attrition Phases

Figure 2 lists historical attrition rates used by the division when scheduling each flying phase's execution. This number reflects average attrition from the previous five classes (USAF Weapons Instructor Course F-16 1997). Attrition measures noneffective syllabus sorties flown. Attrition is caused by numerous factors including: inclement weather, aircraft maintenance, range airspace, flying restrictions, ordnance malfunctions, and failure of students to achieve course standards for a given ride. Of all of these factors, student-based attrition is the one capable of influence by changes in flying syllabus flow. Historically, high-attrition phases include BFM, ACT, and WPNs, each having an average historical attrition of approximately 30 percent (USAF Weapons Instructor Course F-16 1997). High-attrition rates for BFM and ACT phases are attributed to decreased student operational experience and proficiency in BFM and ACT training within their assigned units. Current operations tempo combined with restrictive airspace and fiscal constraints make operational training in these mission areas difficult. These external factors mitigate these high-attrition phases from being significantly altered by this proposal. However, Weapons phase attrition, typically the highest in any class, has great potential for reduction from syllabus flow changes.

The Weapons phase is the culmination phase for WSF students. It is the syllabus's longest, most complex, tactically challenging, and demanding phase students

execute. Students are challenged to plan, brief, execute, and debrief full-scale live weapons deliveries while facing a numerically superior advanced adversary possessing a lethal Integrated Air Defense System (IADS). Because of its length, each student is required to pass seven missions, reducing student-based attrition is paramount (USAF Weapons Instructor Course F-16 1997).

This phase is considered the divisions graduation phase before the final USAFWS graduation phase of ME. Current syllabus flow provides students with all mission fundamentals, skills, and instruction necessary, through previous phases, to perform adequately. The high-attrition rates observed, however, are not typically due to errors in air-to-ground employment execution but due to lack of proficiency and continuity in perishable air-to-air combat skills (Weapons Phase Hotwash 1995b, 1996a, 1996b, 1997a). Figure 3 shows student attrition percentages from air-to-air and air-to-ground deficiencies within the weapons phase of four previous WS classes from 1995 to 1997.

Figure 3 illustrates the excessive percentages of student-based attrition caused by air-to-air deficiencies, in an air-to-ground phase, compared to the more moderate level of attrition caused by air-to-ground related deficiencies. The most common cause for this high air-to-air attrition cited among division instructors is a lack of proficiency and continuity in students air-to-air combat employment skills (Weapons Phase Hotwash 1995b, 1996a, 1996b, 1997a). Instructors also agree that poor execution of air-to-air game plans throughout these graduation-phase missions detracts from students ability to focus on the Weapons phase primary learning objectives (Weapons Phase Hotwash 1996a, 1996b). These primary learning objectives are effective mission planning, target

weaponeering, and target destruction (USAF Weapons Instructor Course 1997). Typical Weapons phase debriefs are dominated by air-to-air engagement reconstruction, air-to-air related discussions, and air-to-air lessons learned taking on average 70 percent of the total debrief time utilized (Weapons Phase Hotwash 1995b, 1996a, 1996b, 1997a). The high air-to-air attrition rates and disproportionate debrief focus can be rectified by changing flying syllabus flow as well. Next is a detailed look at the existing gap in air-to-air flying events.

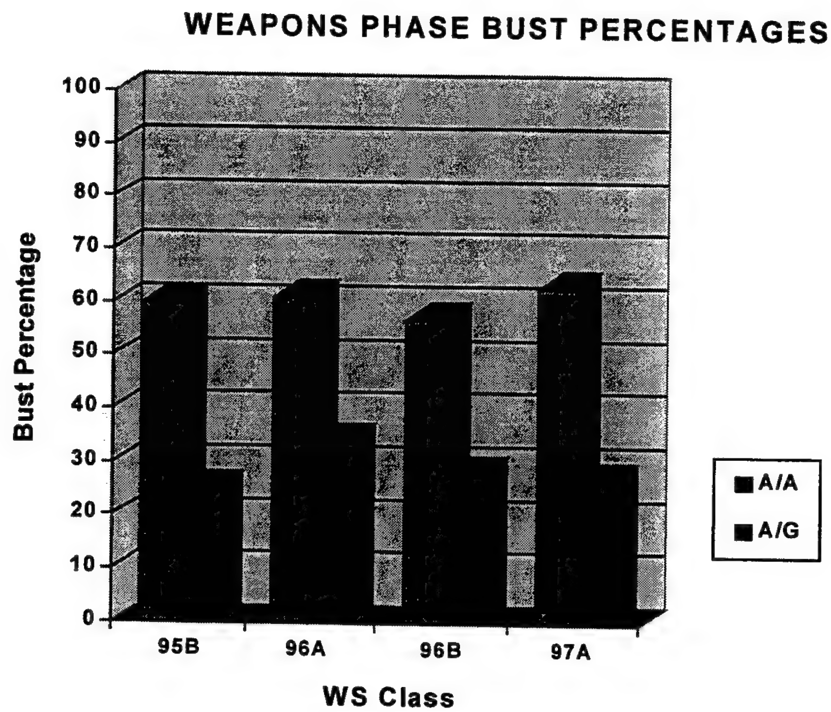



Figure 3

Flying Proficiency Gaps in Perishable Air-to-Air Skills

The high-attrition rates resulting from deficient air-to-air execution observed in the Weapons phase result from the current gap between missions requiring perishable F-16 four-ship air-to-air employment skills.

Figure 4 shows WSF class 98 AIF's student led four-ship air-to-air flying event gap. The forty-seven-day lapse in four-ship air-to-air employment is typical for current WSF flying syllabus flow (98 AIF Mission Calendar Flow 1998). Instructors interviewed agree that this large gap in perishable four-ship air-to-air missions is responsible for disproportionate air-to-air attrition rates observed in the phase (Guastella 1998). Also, IPs concluded that student air-to-air engagement reconstruction skills suffer greatly from this lapse (Moore 1998). This dramatically increases debrief times during the phase, diminishing student and IP attention and learning (Weapons Phase Hotwash 1995b, 1996a). This phase can benefit most from reduced attrition due to its length, vast external support requirements, high per sortie cost, and finite time constraints.

98 AIF FOUR-SHIP AIR-TO-AIR FLYING EVENT HISTORY

| **Last SL 4-Ship Air-to-Air Flying Event** | **Next SL 4-Ship Air-to-Air Flying Event** | **Time Interval** |
| --- | --- | --- |
| ACT-5:15 Sept | WPN-2: 1 Nov. | **47 Days** |

Figure 4

The Weapons phase is the longest flying phase in the F-16 syllabus. It currently maintains the highest attrition rate of any phase. Each student must successfully

accomplish seven flying syllabus missions in sixteen flying training days (BIF calendar class). Assuming the standard 12-student class, this equals 84 required student effective lines in the 16-day fly window, or 5.5 effective student sorties per day. The typical supported flying pattern in Weapons is an 8 turn 8 (four 4-ships per day). This creates 8.0 student lines to achieve 5.5 effective student sorties with zero attrition. Figuring in 30 percent historical attrition (84 + 30% (25 sorties) = 109 student lines) produces 7.0 required student effective sorties out of the 8.0 available daily. When factoring in historical 60 percent scheduling effectiveness, the number of required student effective sorties each day rapidly approaches and exceeds the 8.0 available. These numbers do not include any missions for IPUG sorties which are a division requirement during the phase. The bottom line is that current Weapons phase execution contains excessive air-to-air attrition rates which exacerbate the excessive sortie requirements within the training day window. Historical solutions to this problem have included: reducing IPUG sorties, weekend flying, carrying over of student noneffective missions to ME, and waving student requirements for the phase. This demonstrates how reduced student-based attrition in this phase will be of great benefit. Next follows a review of problems related to the execution of night-flying missions in the current flying syllabus.

## Night-Flying Mission Schedules

Figure 5 depicts a current night-flying syllabus flow distribution for a typical BIF calendar class and illustrates the dispersed nature of night-flying missions. These night missions are accomplished in three separate day-turn-night flying blocks: TI (three to four

days), SA/SAT/CAS (three weeks), and Weapons (one week). This flow presents two unique problems for students and instructors: (1) difficulty adjusting circadian rhythm to rapidly changing short-duration day-night cycles and (2) a lack of concentrated effort and sequential building-block execution of night F-16 mission employment. First, IP and student circadian rhythms within current night mission execution will be examined.

TYPICAL NIGHT-FLYING DISTRIBUTION FOR WSF 12 STUDENT BIF CLASS

| **DATES** | **NIGHT MISSIONS** | **FLYING TURN PATTERN** | **EFFECTIVE SORTIES REQUIRED (Zero attrition)** | **COMPETING DAY MISSIONS** |
|---|---|---|---|---|
| 24-27 August | **TI-5** Night 4 v X | 10 Lines Day Go Turn<br>8 Lines Night Go | 6 | TI-3 and TI-4 |
| 6-8 October<br>12-15 October | **SA-4** Night 2-ship MAV employment | 12 Lines Day Go turn<br>12 Lines Night Go | 12 | SA-1, SA-2, SA-3<br>SAT-1, SAT-2 |
| 6-8 October<br>12-15 October | **SAT-3** Night 2-ship LGB employment | 12 Lines Day Go turn<br>12 Lines Night Go | 12 | SA-1, SA-2, SA-3<br>SAT-1, SAT-2 |
| 19-22 October<br>26 October | **CAS-3** Night 2-ship reduced threat CAS<br>**CAS-3A** Night 2-ship reduced threat FAC-A | 12 Lines Day Go turn<br>12 Lines Night Go | 16 (Assumes 4 FAC-A students) | CAS-1, CAS-2<br>CAS-2A |
| 16-20 November | **WPN-5 CJ/CG** Night 4 ship Strategic attack or SEAD-HTS | 12 lines Day Go turn<br>8 Lines Night Go | 6 (Flown as 8-ship package) | WPN-6,<br>FP1-CG<br>FP-1CJ |

Figure 5

Currently, a typical student flies a single night mission in the TI phase, anywhere from three to four night missions in the SA, SAT, CAS phase flow, and one to two night missions in the Weapons phase. All night missions are flown within a day-turn-night flying schedule. Every night-go has a respective day-go before. This plays havoc on IPs' and students' daily schedule routines and rest cycles as depicted in figure 6.

Figure 6 shows large fluctuations created for students when tasked to accommodate a day-turn-night schedule. Rapid shifts in rise times, flying windows, and bedtimes put students in a state of circadian disarray and fatigue (Comperatore et al. 1993). This repeated pattern of day-night flying diminishes operational risk management putting the division at increased risk for aircrew-related mishaps. Instructor schedules and rest cycles are similarly disrupted during these flying schedules. Since IPs are living with their families and have additional division duty requirements each day, their schedules are affected even more. Students typically have no duty responsibilities until their scheduled academic time or mission brief time, enabling delayed rise and report times (Comperatore et al. 1993). Instructors tend to rise daily at the same time due to household and family routines, regardless of bedtime, and have various division-related tasks to accomplish, requiring them to report as early as allowed by current regulations (8 hours prior to scheduled engine shutdown). Not only does the current night-flying flow create fatigue and scheduling fluctuations, but lacks the continuity of instruction inherent in the syllabus's building-block approach to learning.

TYPICAL STUDENT DAILY SCHEDULE DURING
SA/SAT DAY-TURN-NIGHT FLYING WEEK

| **Student schedule** | **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** |
|---|---|---|---|---|---|
| Rise-time: | 0800 | 0800 | 1000 | 0700 | 0700 |
| Academics: | 1100-1300 | 1500-1700 | 1100-1300 | 1100-1300 | 0800-1600 |
| Mission:<br>Brief:<br>Land: | **SA-3 Day**<br>1530<br>1900 | **SA4 Night**<br>1900<br>2330 | **OFF** | **SAT-1 Day**<br>1530<br>1900 | **No Student Flying** |
| Debrief:<br>Bedtime: | 2100-2230<br>0000 | 0030<br>0300 | 2200 | 2100-2300<br>0000 | As Desired |

Figure 6

Current night-flying mission flow is spaced out over several months hindering the students' ability to focus and concentrate on night specific F-16 employment skills. This results from night-flying missions being executed as an integral part of each respective flying phase and associated block of instruction, instead of being executed as a separate and complete night-flying phase.

WSF currently teaches F-16 night employment as a branch of daytime employment and tactics. Although some mission fundamentals and employment skills do not change from day to night (TGP use, radar mechanics, weaponeering, etc.), several others do require night specific tactics and execution (attack planning, ingress formations, radar sort and targeting, threat reactions, reforms, etc.). Current F-16 operational flying emphasis remains focused on night employment of assigned missions. The current syllabus content addresses this by the inclusion of a night combat mission counterpart (OCA, DCA, Strategic Attack, SEAD, CAS and FAC-A) for each respective day mission

taught. Like any other set of instructional skills taught to division students, night-flying employment skills are best suited for concentrated, continuous building-block instruction, teaching night flying as a distinct and unique form of F-16 mission employment. Another problem with the current syllabus's night-flying flow is the competition for time and resources between instructing and flying day and night missions simultaneously (shown in figure 5).

Under the current flow, students and instructors alike, shift between day and night missions, whose planning, briefing, and execution differ greatly. This increases student and instructor workloads by forcing continuous subject matter shifts as they prepare for missions and confer in tactical discussions. Constantly shifting gears from day to night F-16 employment does not optimize the students' ability to retain instructional information or gain flying proficiency in F-16 night employment skills. All other F-16 employment skills are taught in sequential, seamless progressions within their respective phases, maximizing learning , retention, and flying proficiency throughout. Examples of this are the BFM and ACT phases, respectively. Night missions within the current syllabus should follow the same format for the same reasons. Recently, WSF incorporated NVG use on all night missions. This new NVG addition highlights this problem.

The addition of NVG use on all syllabus sorties flown at night causes problems for students who are not NVG qualified upon arrival. Long down times (decreased continuity) between night sorties in the current syllabus flow makes maintaining proficiency and retaining NVG skills difficult. A typical student will spend the majority

of each consecutive NVG mission rehoning basic skills learned the mission prior (Guastella 1998). By aligning all night missions within a single night phase executed within a night instructional block , the students' continuity, proficiency, and learning of NVG use could increase dramatically. Next is a review of the current academic syllabus flow.

## Current Academic Syllabus Flow

The current academic syllabus consists of 329.5 hours of scheduled instruction, broken down as in figure 7 (USAF Weapons Instructor Course F-16 1997).

SCHEDULED INSTRUCTION

| Subject Block | Hours |
|---|---|
| Aircraft Design and Maneuverability (ADM) | 6.0 |
| Aircraft Avionics System (AVS) | 53.5 |
| Command, Control, and Communications (CCC) | 1.0 |
| Capabilities and Limitations of US Weapons (CWU) | 15.0 |
| Capabilities and Limitations of Foreign Weapons (CWX) | 22.0 |
| Mission Planning and Employment (EMP) | 65.5 |
| Mission Planning Tools and Resources (MSN) | 23.5 |
| Physics, Physiology, and Psychology (PPP) | 16.5 |
| Stores and Subweapons Systems Descrip. and Employment (SSS) | 39.5 |
| *Independent Research for Student Paper | (50.0) |
| *Student Presentation preparation | (8.0) |
| Student Presentation | 1.0 |
| Weapons Officer Preparation (WOP) | 86.0 |
| **TOTAL** | **329.5** |

*Not scheduled

Figure 7

Each subject block listed is further broken down into several specific academic courses. The current syllabus attempts to align courses with their respective flying phases, providing timely relevant academic instruction required for planning, briefing, executing, and debriefing each flying syllabus phase. Major academic blocks are evaluated by written examination. The minimum passing grade for each examination is 80 percent, with all examinations corrected to 100 percent. Students complete over fifteen examinations during the class. Students also complete a research paper on an assigned topic dealing with tactical airpower employment (typically F-16 specific) or airpower systems. Students also present formal briefings of their paper topics to a select panel of division instructors for grade (USAF Weapons Instructor Course 1997). Outstanding student papers are published in the Weapons School's *Weapons Review* magazine. The majority of academic instruction is division specific, presented to students only in relevant WS Divisions. There are, however, two separate week-long blocks of core academics (Core I and Core II) presented to all WS students.

Core instruction focuses on generic, CAF-wide topics and are completed before students fly at the beginning of the course and before the Mission Employment phase near course completion. Core courses are WS driven and therefore are not considered in this thesis. All other F-16 student academic courses are WSF taught and scheduled, and are the focus of this proposal.

The current academic syllabus is front loaded and very busy. For the most part it provides academic instruction in a timely manner relative to related flying phases. For the purpose of this study any WSF academics taught within two weeks of their related

flying phase counterpart are considered effective in student retention and application. Figure 8 identifies current academic subjects not meeting this criteria (97 BIF Academic Calendar 1997).

97 BIF ACADEMIC COURSE APPLICATION DELAY

| **Academic subject** | **Phase /Date Taught** | **Phase/ Date applied** | **Application delay (days)** |
|---|---|---|---|
| LANTIRN | TI: 5 Aug. | SA: 28 Sept. | **53** |
| F-16 Conventional TOs | TI: 10 Aug. | SA: 28 Sept. | **48** |
| AGM-65 Maverick | TI: 28 Aug. | SA: 28 Sept. | **30+** |
| Computed Weapons Delivery Theory | ACT: 2 Sept. | SA: 28 Sept. | **30** |
| LGB Theory | ACT: 4 Sept. | SA: 28 Sept. | **26+** |
| PW I, II, and III | ACT: 4 Sept. | SA: 28 Sept. | **24+** |
| Suspension and Release equipment | ACT: 7 Sept. | SA: 28 Sept. | **21** |

Figure 8

The application delay of courses shown ranges from twenty-one to fifty-three days. Within these application delays students are receiving and applying instruction on flying events unrelated to classroom academic instruction. Several students on their TI and ACT phase critiques stated an inability to concentrate or retain academic instruction on subject matter not directly related to the current flying phase (96A ACT Phase Student Critique 1996). Instructors cited several instances during SA and SAT phases where students failed to demonstrate retention or application of relevant academic course

material (97A SAT Phase IP Critique 1997). This causes inefficiencies in day-to-day operations, requiring constant remedial student instruction and inefficient one-on-one IP-student instruction. These problems can be minimized by adjusting academic course flow within the syllabus.

Finally, a review of the primary research tool utilized to collect the information relevant to this thesis's primary and secondary arguments.

## Research Survey

The research tool utilized consisted of a twenty-eight-question survey (appendix A) collecting data for the primary and secondary research questions. The survey audience consisted of eighteen USAF/WS F-16 Division instructors. Requirements for instructors taking the survey were as follows: (1) graduate of F-16 WIC, (2) current instructor assigned or attached to F-16 Division of WS, and (3) instructed minimum of two complete WSF student classes.

The survey provided each instructor with figures illustrating current and proposed WSF flying and academic syllabus flow. It defined key terms unique to the proposed syllabus and listed assumptions inherent to its design. The IP responses were measured along a 5-Point Leichert Scale of strongly agree, agree, neutral, disagree, and strongly disagree. Survey questions concentrated on gathering IP opinions on proposed research concepts and the following supporting research questions:

1. Does changing phase flow and framework create greater learning opportunities for the student?

2. Can altering phase flow reduce attrition and preserve continuity in perishable air-to-air skills?
3. Will a single night-phase -instructional block increase student learning?
4. Can altering academic syllabus flow increase student learning and retention?

Survey results are quantified, interpreted, and discussed in the review of proposed WSF flying and academic syllabus flow in chapter 4.

# CHAPTER 4

# PROPOSED FLYING AND ACADEMIC SYLLABUS

This chapter contains a discussion of the proposed WSF flying and academic syllabus. It uses the literature review, survey data, and WSF hot-wash information for arguing their merits. Survey results are measured and tabulated in appendix B for review. As mentioned previously, both proposed syllabus revisions are designed within the current ninety-eight day, BIF calendar class time frame. The information is presented to support the following seven areas:

1. Revised flying syllabus flow
2. Supporting concepts data
3. Instructional block framework
4. Reduced attrition
5. Night instructional block
6. Revised academic syllabus
7. Academic flow benefits

## Proposed Flying Syllabus

First is the proposed flying syllabus for WSF. Figure 9 illustrates the current and proposed WSF flying syllabi. The new syllabus flow preserves the flying phases of the current syllabus, improving upon its building-block design. It aligns these phases within the new instructional block framework.

## CURRENT AND PROPOSED WSF FLYING SYLLABI QUICK LOOK

**Current Syllabus Flow:**

| **Mission** | **Phase** |
|---|---|
| BFM-1 | BFM |
| BFM-2 | |
| BFM-3 | |
| BFM-4 | |
| BFM-5 | |
| BFM-6 | |
| ACM-1 | ACM |
| TI-1 | TI |
| TI-2 | |
| TI-3 | |
| TI-4 | |
| TI-5 *NIGHT* | |
| ACT-1 | ACT |
| ACT-2 | |
| ACT-3 | |
| ACT-4 | |
| ACT-5 | |
| AAWE-1 | AAWE |
| AAWE-2 | |
| SA-1 | SA |
| SA-2 | |
| SA-3 | |
| SA-4 *NIGHT* | |
| SAT-1 | SAT |
| SAT-2 | |
| SAT-3 *NIGHT* | |
| CAS-1 | CAS |
| CAS-2 | |
| CAS-2A | |
| CAS-3 *NIGHT* | |
| CAS-3A *NIGHT* | |
| WPN-1 | Weapons |
| WPN-2 | |
| WPN-3 | |
| WPN-4 | |
| WPN-5CG NITE | |
| WPN-5CJ NITE | |
| WPN-6 | |
| FP-1CG | FP |
| FP-1CJ | |
| ME 1-3 | ME |

**Proposed Syllabus Flow:**

| **Mission** | **Instructional Block** |
|---|---|
| BFM-1 | **Block 1:Instruction of F-16 Mission Fundamentals** |
| BFM-2 | (Phases executed within) |
| BFM-3 | (Briefings: ***Instructional***) |
| BFM-4 | |
| BFM-5 | |
| BFM-6 | |
| ACM-1 | |
| TI-1 | |
| TI-2 | |
| TI-3 | |
| TI-4 | |
| SA-1 | |
| SA-2 | |
| SA-3 | |
| SAT-1 | |
| SAT-2 | |
| CAS-1 | |
| CAS-2 | |
| CAS-2A | |
| AAWE-1 | AAWE |
| AAWE-2 | |
| TI-5 | **Block-2: Instruction of F-16 Night Employment** |
| SA-4 | (building-block approach within) |
| SAT-3 | (Briefings: *Instructional*) |
| CAS-3 | |
| CAS-3A | |
| ACT-1 | **Block-3: Instruction of F-16 Combat Mission Execution** |
| ACT-2 | (Briefings: ***Go to War***) |
| ACT-3 | |
| ACT-4 | |
| ACT-5 | |
| WPN-1 | |
| WPN-2 | |
| WPN-3 | |
| WPN-4 | |
| WPN-5CG *NIGHT* | |
| WPN-5CJ *NIGHT* | |
| WPN-6 | |
| FP-1CG | |
| FP-1CJ | |
| ME 1-3 | |

Figure 9

The proposed flying syllabus flow differs from the current flow design in four major areas:

1. Total building-block approach executed within instructional block framework
2. All instructional missions accomplished before go-to-war missions
3. All night employment missions flown within a single night instructional block
4. Air Combat Tactics phase executed directly before Weapons phase

As shown, the current midclass AAWE deployment to Tyndall Air Force Base remains unchanged. The proposed syllabus does not alter the flow or placement of BFM, ACM, WPN, or ME phases. These phases are aligned within the instructional blocks and retain their current calendar flow. All other phases are dismantled and assembled in a total building-block framework within the three instructional blocks. The calendar flow of the new flying syllabus, using a BIF calendar class , with its three instructional blocks is compared to the current syllabus calendar flow in figure 10.

CURRENT AND PROPOSED SYLLABI FIT

| **Phases** | **Dates** | **Training Days** | **# Student rides** | **Avg. Historical Attrition** |
|---|---|---|---|---|
| TI/ACT | 5Aug.-17Sept. | 26 | 10 | 27.5% |
| AAWE | 19Sept.-26Sept. | 4 | 2 | 5% |
| SA/SAT | 28Sept.-16Oct. | 13 | 7 | 10% |
| CAS/WPN | 16Oct-20Nov. | 22 | 10 | 25% |
| NEW | | | | |
| Block-1 | 5Aug.-17Sept. | 26 | 11 | 16.5% |
| AAWE | 19Sept.-26Sept. | 4 | 2 | 5% |
| Block-2 | 28Sept.-16Oct. | 13 | 4 | 10% |
| Block-3 | 16Oct-20Nov. | 22 | 12 | 27.5% |

Figure 10

The proposed flying syllabus is integrated within the same calendar date groups as the existing syllabus. There are three calendar fit changes in the new syllabus design.

First, instructional Block 1 includes one additional student mission requirement within the allotted twenty-six-day window. This is offset by the significantly reduced average historical attrition (-11%) programmed in the new instructional block compared to the current phase flow attrition. Moving the ACT phase and replacing it with specific missions from the SA and SAT phases creates the attrition reduction.

Second, instructional Block 2 requires three less missions than the current flying syllabus accomplishes during its thirteen-day flying window. This block is the night employment block, which typically has very low attrition rates. The reduced mission requirement will be used, most likely, to offset the third difference shown in Instructional Block 3.

Instructional Block 3 requires two additional missions in the allotted twenty-two-day flying window with an average historical attrition rate 2.5 percent higher than the current phase flow for the same period. This increase in mission requirements will most likely be absorbed by an earlier Instructional Block 3 starting date due to the excessive flying day allotment and low attrition of Instructional Block 2. For example, if the second instructional block ends on 13 October instead of 16 October, this provides Block 3 with three additional flying training days.

The new phase flow also better distributes historical attrition rates over the course duration, yielding an overall average course flow attrition rate 2.1 percent lower than the current syllabus phase flow. Figure 10 does not take into consideration any potential

reduced attrition benefits gained from the proposed syllabus flow. Attrition rates shown and manipulated are in accordance with the current ACC syllabus.

## Supporting Concepts Data

This proposal is based on four supporting ideas:

1. Changing flying and academic syllabus flow is a valid means for increasing student learning and instruction.
2. Changing flying and academic flow can increase the instructional quality of the institution.
3. Changing flying syllabus flow can reduce student-based attrition.
4. Air-to-air employment skills are the most perishable of all skills taught to students at the weapons school.

The eighteen WSF instructors surveyed were asked whether or not they agree with the statements listed above. Figure 11 shows the percentage of the instructors in agreement with the supporting concepts for this proposal.

As Figure 11 illustrates, 78 percent or greater of the IPs surveyed were in agreement with all the supporting concepts for the proposed syllabus. Significant to note is that 100 percent of the IPs agreed that changing the flying and academic syllabus flow can increase the instructional quality of the division. Of the IPs, 94 percent agreed that student air-to-air flying skills are the most perishable. This shows direct support for maximizing student air-to-air proficiency within the syllabus. This is accomplished through increased flying continuity.

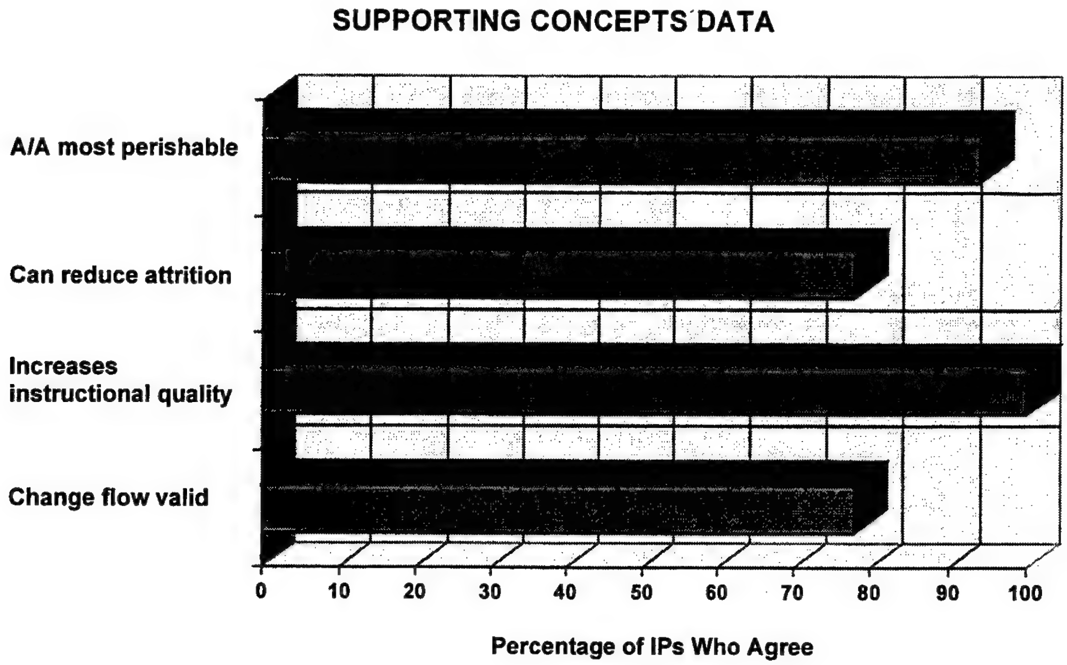



Figure 11

Consensus among division IPs validates the supporting concepts. These concepts are the foundation upon which the proposed syllabus was designed. They set the conditions necessary for improvement within the existing syllabus.

## Instructional Block Framework

The proposed syllabus flow aligns the current phases into the three instructional blocks as shown previously. This new framework builds upon the existing desire for a building-block, "walk-before-you-run" syllabus execution. It presents all fundamental F-16 employment skills before exposing students to complex combat simulation missions. This framework ensures students have learned and demonstrated an instructional aptitude for all required employment skills prior to any dynamic combat

scenario. Figure 12 presents the percentage of IPs who agree with questions asked concerning the proposed instructional block framework.

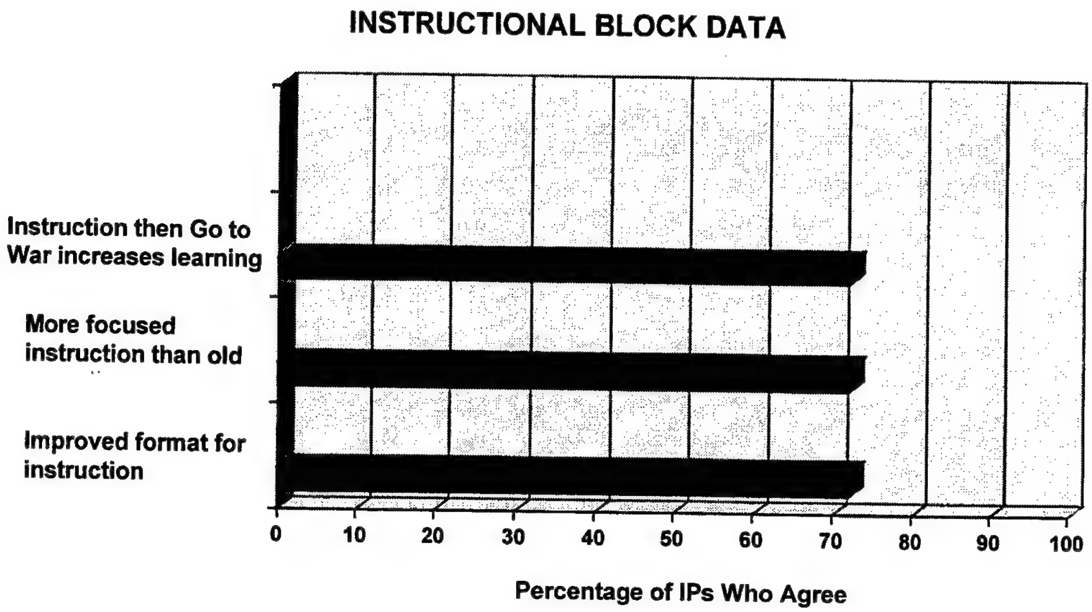



Figure 12

Figure 12 illustrates that 72 percent of all instructors surveyed agree that the instructional block framework provides a more-focused instruction than the current phase flow, provides an improved format for concentrated IP instruction and agree that executing all basic instructional missions prior to dynamic combat employment missions will increase student learning. These numbers reflect significant backing for the instructional block framework design within the new proposed flying syllabus.

The new framework provides a total building-block approach to the flying syllabus, from BFM to ME. It eliminates phase flow having both instructional and go-to-

war briefings. It maximizes flying continuity in all employment skills, especially night and air-to-air combat missions.

Instructional Block 1, the instruction of F-16 mission fundamentals, takes students through all fundamental phases of F-16 instruction. The phase and ride progression within this block is similar to the existing syllabus flow for the given flying window. Major differences include the deletion of ACT (combat mission execution) and the deletion of night mission employment rides from within their specific phase flows.

Instructional Block 2, the instruction of F-16 night employment, is a five-ride night-flying block of instruction. This block creates a logical building-block progression for the instruction of night F-16 employment. It preserves student proficiency and maximizes student continuity in night-flying skills. It is configured to instruct students in basic night intercept employment (TI-5), threat reactions, and Precision-Guided Munitions (PGM) employment (SA-4), two-ship PGM tactics (SAT-4), two-ship CAS employment, and night FAC-A for qualified students. Additional data on its potential benefits is presented in the night-phase flow section of this chapter.

Instructional Block 3, the instruction of F-16 combat mission execution, is the culminating instructional block, empowered by the completion of Instructional Blocks 1 and 2. This fifteen-ride block generates a seamless progression of combat employment in both four-ship (+) air-to-air and air-to-ground employment scenarios. Its design maximizes flying event continuity and flying proficiency, facilitating the instruction of the most demanding and complex missions in the syllabus.

## Reduced Attrition

The proposed flying syllabus is designed to reduce student-based attrition, while maintaining course standards, throughout its execution. Its design intent is to improve the syllabus's ability to raise the student to the course standards, and prevent the opposite of lowering course standards to the level of student performance. The primary means for accomplishing this are preserving student flying proficiency, especially in air-to-air skills, and maximizing student flying event continuity. Figure 13 depicts instructor survey data related to the proposed flying syllabus and reduced student attrition.

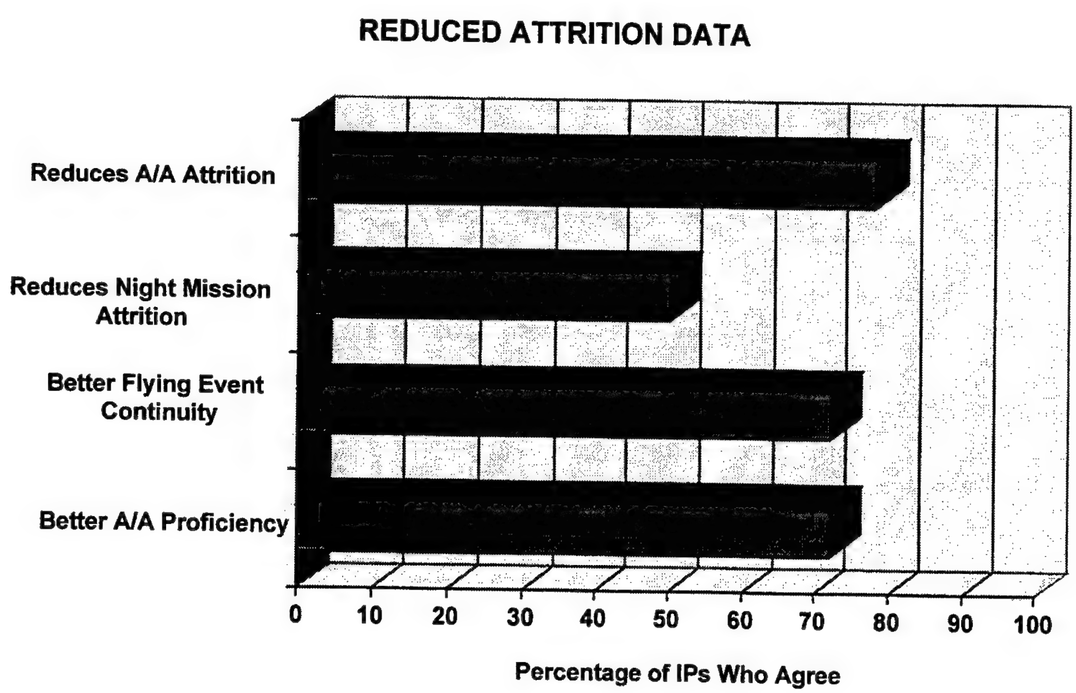



Figure 13

Figure 13 shows that 78 percent of the IPs surveyed agree that the proposed flying syllabus flow will reduce student-based air-to-air attrition. This argument is supported by

the 72 percent of IPs who agree that the proposed flying syllabus will increase student flying event continuity and will increase air-to-air flying event proficiency over the current syllabus. Only 50 percent of the IPs surveyed agreed the proposed flying syllabus will decrease attrition in night employment missions. This low percentage is explained by IP comments on the surveys stating that student-based night employment mission attrition is typically very low (<5%) and cannot be significantly reduced.

The proposed flying syllabus creates better flying event continuity and preserves flying event proficiency in three ways: (1) eliminates the forty-seven-day lapse in student-led, four-ship, air-to-air events (Block 3: ACT-WPN flow); (2) creates a seamless consecutive flow of four-ship, air-to-air, combat-mission employment (Block 3: ACT-WPN-ME); (3) and also preserves student-flying continuity via the seamless night instructional block flow (Block 2: TI-5, SA-4,SAT-3,CAS-2). Reducing student-based attrition also saves precious funding dollars and generates increased potential for flying syllabus expansion, IPUG sorties, and CT training.

## Night Instructional Block

The proposed flying syllabus dramatically changes the night-flying mission flow with the creation of Instructional Block 2. The flying proficiency and event continuity benefits were already discussed in the reduced attrition section. This block also preserves proficiency and maximizes continuity for any students receiving NVG instruction. The five-ride, night-mission flow provides adequate successive NVG missions to fully qualify

students as NVG wingman in accordance with current ACC regulations. Block 2 also presents a night-go only schedule stabilizing student and instructor daily schedules.

Executing a night only schedule standardizes academic, brief, and mission times for the entire block of instruction. This sets the conditions for the IP and students to effectively adjust their circadian rhythms to a night-flying schedule. This shift maximizes rest, reduces fatigue, and mitigates the risk associated with F-16 night employment (Comperatore et al. 1993). Figure 14 illustrates the daily schedule stabilizing effects of a night -go only schedule. As shown, a typical student aligns into a daily routine composed of consistent event times.

NIGHT INSTRUCTIONAL BLOCK STUDENT DAILY SCHEDULE

| **Student schedule** | **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** |
|---|---|---|---|---|---|
| Rise-time: | 1100 | 1100 | 1100 | 1100 | 1000 |
| Academics: | 1600-1800 | 1600-1800 | 1600-1800 | 1600-1800 | 1100-1700 |
| Mission:<br>Brief:<br>Land: | **TI5 Night**<br>2030<br>2330 | **SA4 Night**<br>2030<br>2330 | **OFF/ Study-Plan** | **SAT3 Night**<br>2030<br>2330 | **No Student Flying** |
| Debrief:<br>Bedtime: | 0030<br>0300 | 0030<br>0300 | 0300 | 0030<br>0300 | As Desired |

Figure 14

Block 2 eliminates the competition between instructing day and night F-16 employment simultaneously. This allows students and instructors to focus their attentions on a single employment block, maximizing the efficiency and effort of both

parties involved. Figure 15 presents survey data showing the percentage of IPs who agree with the proposed night instructional block's ability to maximize night-flying event continuity, increase student learning of night employment skills, increase student retention of those skills, and provide improved learning of F-16 night employment over the current syllabus.

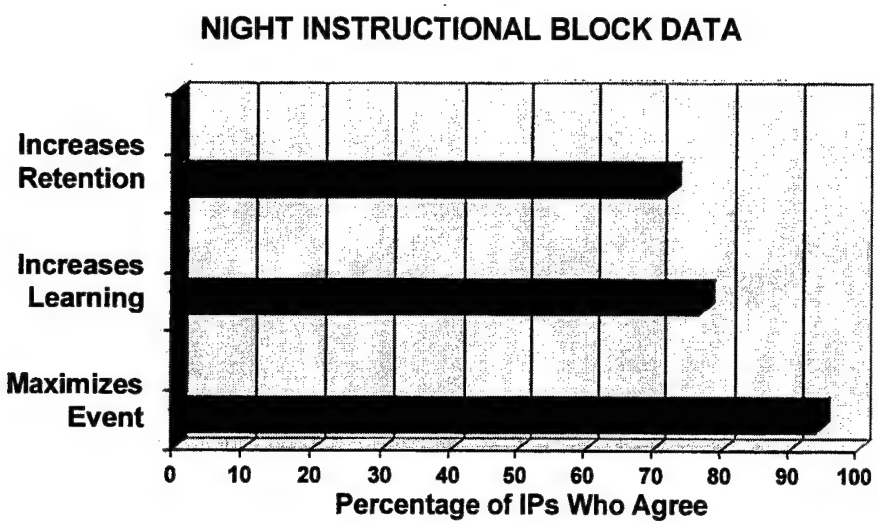



Figure 15

Figure 15 shows that 94 percent of the IPs surveyed believe the proposed night instructional block will maximize night-flying event continuity over the current syllabus. As mentioned previously the division instructors see limited student-based attrition benefits from the increase flying event continuity due to the existing low attrition nature of these missions. The benefit of the increased flying event continuity will be demonstrated through improved student retention and learning of F-16 night employment skills.

Of the IPs, 77 percent and 72 percent agree the proposed night block will increase student learning and retention of night employment skills, respectively, over the current syllabus. These numbers represent strong justification for the proposed night instructional block.

Block 2 has additional benefits resulting from the night-go only schedule format inherent in its design, primarily, preserving student and IP circadian rhythms, which sets the conditions for improved learning and instruction. Figure 16 shows IPs' survey responses to questions concerning these added benefits.

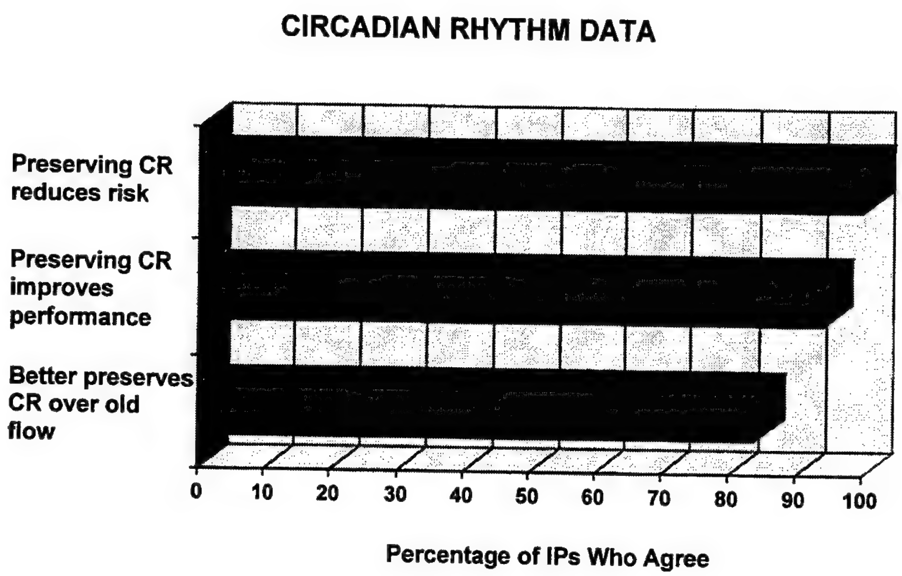



Figure 16

Of the IPs surveyed, 94 percent agree that preserving IP and student circadian rhythm will improve flying performance. The 84 percent agree that the proposed night

instructional block flow will better preserve circadian rhythm over the existing syllabus. The IPs surveyed unanimously agree (100 percent) that preserving student and instructor circadian rhythm will reduce operational risks associated with night flying. The proposed night block also conforms to the 1993 United States Army Aeromedical Research Laboratory report, *Activity/Rest Patterns of Instructor and Rated Student Pilots During Rapid Transitions from Daytime to Nighttime Duty Hours at the Eastern Army Aviation Training Site*, which concluded the best method for producing the desired circadian rhythm shifts is by conducting night-go only flying schedules between four days and two weeks duration, as the proposed night syllabus does. This study also concluded that day-night go flying schedules create fatigue and performance problems for locally stationed instructors, and recommended the night-go only format to reduce these factors (Comperatore et al. 1993).

## Revised Academic Syllabus

The proposed academic course flow is compared with the current academic flow in figure 17. Core I and Core II calendar flow and content are WS controlled and are not considered in this proposal. The revised academic course flow contains four major redesign initiatives:

1. Reducing application delays of course material
2. Increasing student retention of academic material
3. Improving academic course alignment with their respective flying phases
4. Reducing remedial student instruction requirements

PROPOSED ACADEMIC SYLLABUS FLOW

| Current Phase Flow | Current Course Flow | New Flying Phase Flow | New Academic Flow |
|---|---|---|---|
| CORE I | CORE Courses, F-16 Radar | CORE I | CORE Courses, F-16 Radar |
| BFM | BFM, AIM-9, AIM-120 Gun, RWR/ECM/ALE | **BLOCK-1**<br>BFM | BFM, AIM-9, AIM-120 Gun, RWR/ECM/ALE |
| ACM | -ACM<br>-TI | ACM | -ACM<br>-TI<br>-4-Ship A/A employ |
| TI | Thrx A/C, AAA,SAMs<br>-LANTIRN<br>-DCA<br>-Night A-A<br>-4-Ship A/A employ<br>-OCA<br>-F-16 Conv. WPN T.O. and Attack Computation<br>-Maverick<br>-Maverick Interface and Employment. | TI 1,2,3,4 | Thrx A/C, AAA,SAM's<br>-LANTIRN<br>-F-16 Comp. Weapon delivery theory<br>-Maverick<br>-Maverick Interface and employment<br>-LGB Employment<br>-PW I, II,III<br>-HTS/HARM interface<br>-HARM Employment<br>-F-16 Conv. WPN T.O. and Attack Comp. |
| ACT | -F-16 Computed Weapons Deliv. Theory<br>-LGB Employment<br>-PW I, II, III<br>-Suspension and Rel.<br>-GP Bombs & Fuses<br>-CBU Bomb & Fuses<br>-HTS/HARM Interface<br>-HARM Employment | SA1,2,3<br>SAT 1,2 | -HARM Msn. Planning<br>-Suspension and Rel.<br>-SAMP (5 Courses)<br>-GP Bombs & Fusses<br>-CBU Bombs & Fuses<br>-CAS<br>-FAC-A |
| | | CAS 1,2,2A | -Night A-A<br>-NVG |
| AAWE | SAMP (5 Courses), A/R | AAWE | MAROPS, CSAR, A/R |
| SA/SAT | -HARM Msn. Planning<br>-NVG<br>-CSAR<br>-CAS<br>-FAC-A | **BLOCK-2**<br>NIGHT PHASE<br>TI-5, SA-4, SAT-3<br>CAS-3, 3A | -OCA<br>-DCA<br>(Remaining AAMP) |
| CAS | MAROPS<br>JMEM<br>MSN/CC Consid. | **BLOCK-3**<br>ACT 1-5 | -JMEM |
| WPN | None | WPN 1-6, FP | None |
| CORE II | | CORE II | |
| ME | None | ME | None |

Figure 17

Figure 17 illustrates how the proposed academic course flow better aligns relevant academic classroom material to its respective flying phase counterpart. Figure 18 shows the percentage of IPs surveyed who agree with the following: that the current academic courses are not adequately aligned with their respective flying phases, that the academic subject matter taught is not always relevant to the current flying phase, and that applying academic instruction as soon as possible in its respective flying phase maximizes student learning.

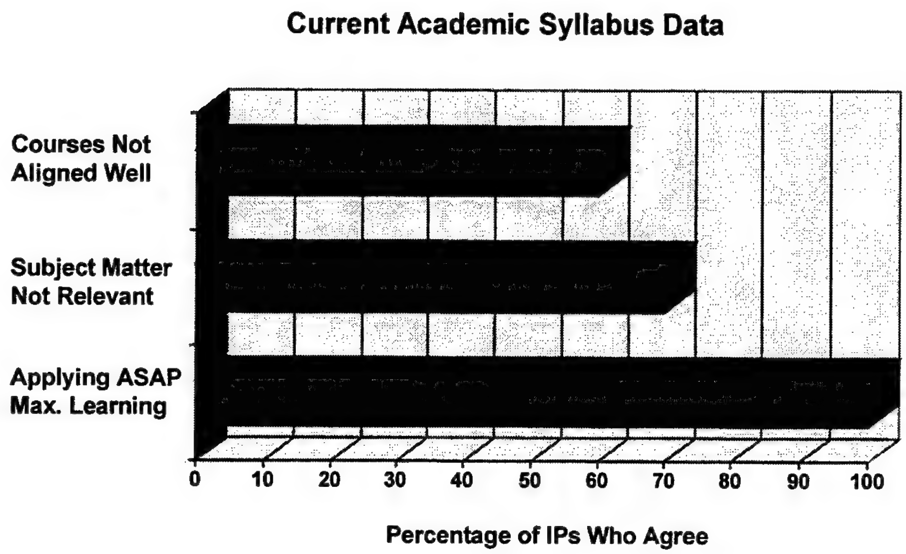



Figure 18

Of the IPs surveyed, 60 percent agree that the current academic course flow is not adequately aligned with its respective flying phase counterpart. The 70 percent agree that the courses taught are not always relevant to the flying phase being executed. Of greatest significance to this proposal is the fact that 100 percent of the IPs surveyed agree that

applying academic material as soon as possible in its respective flying phase will maximize student learning. This unanimous consent supports the reduced application delays inherent to this proposal.

The new syllabus flow significantly reduces the application delays of air-to-ground related subject matter by displacing the ACT phase to Instructional Block 3.

Figure 19 illustrates the significant reduction of academic application delay under the proposed syllabus. The 67 percent of all air-to-ground academic material is applied within one week of being taught, with the remaining 33 percent applied inside three weeks.

BIF HYPOTHETICAL ACADEMIC COURSE APPLICATION DELAY

| **Academic subject** | **Phase/Date Taught** | **Phase/Date applied** | **Application delay (current)** |
|---|---|---|---|
| LANTIRN | TI: 5 Aug. | SA: 26 Aug. | **21 (53)** |
| F-16 Conventional TOs | TI: 10 Aug. | SA: 26 Aug. | **16 (48)** |
| Computed Weapons Delivery Theory | TI: 10 Aug. | SA: 26Aug. | **16 (30)** |
| GP/CBU Bombs and fuses | TI: 21 Aug. | SA: 26 Aug. | **5** |
| AGM-65 Maverick | SA: 28 Aug. | SA: 30 Aug. | **2 (30)** |
| LGB Theory, PW I,II and III | *SA: 29 Aug. | SA: 30 Aug. | **2 (26)** |
| HARM/ HTS HARM Employ. | SA: 4 Sept. | SA: 7 Sept. | **3** |
| CAS/FAC-A | *SA: 5 Sept. | CAS: 7 Sept | **2- Ongoing** |
| Suspension and Release Equipment | SAT/CAS: 11 Sept. | SA: 26 Aug. | **Ongoing** |

*Weekend Instruction

Figure 19

The reduced number of training days in the proposed Block 1 prior to SA, SAT, and CAS phase missions increases the academic course load requirements. There are offsetting factors within this reduced training window. The OCA and DCA academics are moved to Block 2 freeing up 8.0 hours of academic instruction, but is offset by the requirement to teach HARM/HTS academics (8.0 hours) in its place. Solutions to this problem include: maximizing student academic-hour instruction during the week vice just on Fridays, and as shown in Figure 19, teaching academics on weekends during this high course load period. Lastly, teach "common knowledge" type academics, such as suspension and release and general purpose bombs and fuses, as the phase is ongoing rather than prior to any application. The potential benefit of reduced application delays and of maximizing student retention and application should justify such a schedule when needed. Figure 20 illustrates survey data concerning the proposed academic course flow.

Figure 20 clearly shows the very strong IP support for the proposed academic syllabus flow. Of the IPs surveyed, 100 percent agree that applying academic instruction as soon as possible in its respective flying phase maximizes student retention of academic materiel. The 95 percent also agree that the proposed academic syllabus will increase student learning and retention over the current academic course flow. This data directly enforces this thesis supporting question concerning the academic syllabus flow.

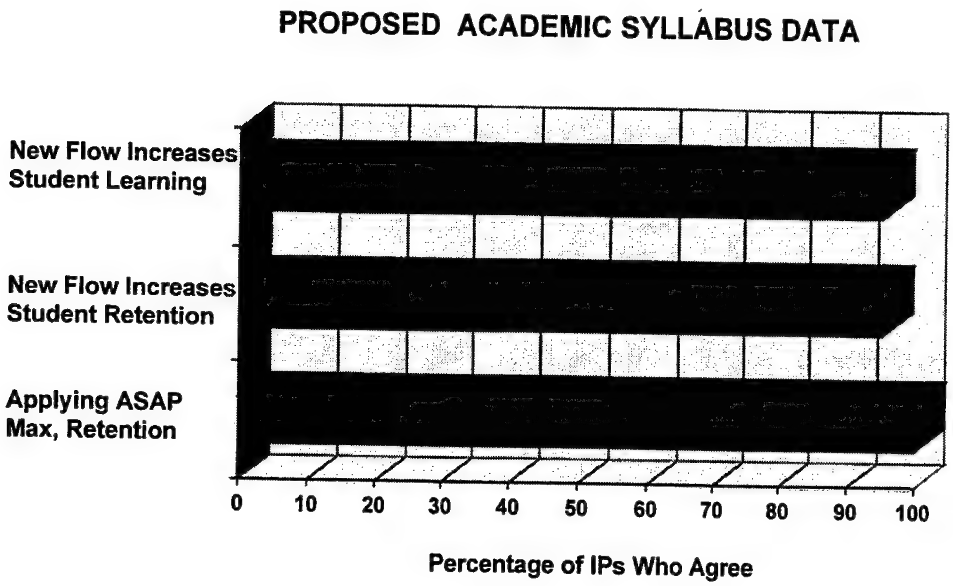

PROPOSED ACADEMIC SYLLABUS DATA
New Flow Increases Student Learning
New Flow Increases Student Retention
Applying ASAP Max, Retention
0
10
20
30
40
50
60
70
80
90
100
Percentage of IPs Who Agree

Figure 20

# CHAPTER 5

# CONCLUSIONS AND RECOMMENDATIONS

This chapter presents conclusions which emerged from the research conducted and their answers to the primary and secondary research questions. It provides research relationships and makes insights to previous studies. Finally, it recommends changes for WSF flying and academic syllabus, as well as further research in this area.

## Conclusions

The research conducted set out to answer the following primary and secondary research questions for this thesis:

Primary Research Question: Can establishing a phase-based instructional framework while optimizing the order in which the F-16 Division executes its flying and academic syllabus improve the instructional quality of the institution?

Supporting Research Questions:

1. Does changing the phase flow and framework create greater learning opportunities for the student?
2. Can altering phase flow reduce attrition and preserve continuity in perishable F-16 employment skills?
3. Does executing all F-16 night employment missions in a single night phase instructional block increase student learning?
4. Can altering the flow of F-16 academic syllabus courseware increase student learning and retention?

First are individual conclusions for each supporting research question.

Supporting Question 1: Does changing the phase flow and framework create greater learning opportunities for the student?

The research establishes measurable justification that the proposed phase-flow, with its inherent instructional block framework does create greater learning opportunities for the student. Specifically, 72 percent of the IPs surveyed agree that the proposed phase-flow/framework will provide :

1. More focused instruction than the current syllabus flow
2. Improved format for concentrating IP instruction
3. Increased student learning through its design of executing all basic instructional missions prior to any dynamic combat employment missions

Specific benefits for the instructional block framework are as follows:

1. Total building-block approach to instruction from BFM to ME
2. Elimination of phase-flows having both instructional and go-to-war briefs
3. Increased flying continuity in air-to-air and night employment skills
4. Preservation of WSF walk-before-you-run flying syllabus design

Supporting Question 2: Can altering Phase flow reduce attrition and preserve continuity in perishable F-16 employment skills?

The research revealed the proposed syllabus has significant capability for reducing student-based attrition and preserving flying continuity in perishable F-16 employment skills. Specifically, 78 percent of IPs surveyed agreed that the proposed flying syllabus will reduce student-based attrition in air-to-air skills. The 72 percent

agreed the proposed flying syllabus has better flying event continuity and better maintains student air-to-air flying proficiency than the current syllabus.

The proposed flying syllabus creates better flying event continuity and preserves flying event proficiency in three major areas:

1. Eliminates the current forty-seven-day lapse in student-led, four-ship, air-to-air events
2. Creates a seamless flow of four-ship or greater air-to-air combat mission employment
3. Instructional Block 2's seamless execution preserves student night-flying continuity

Potential shortcomings to these benefits, listed as a comment on IPs survey, were the long delay before students lead a four-ship, air-to-air mission (ACT-2, Instructional Block 3) and the break in finishing the existing building-block air-to-air training by moving the ACT phase. Students do fly numerous four-ship, air-to-air and air-to-ground missions in the proposed syllabus before the ACT phase, but under current syllabus content, will not lead a four-ship air-to-air mission until ACT-2.

A potential compromise can be accomplished between maintaining current air-to-air building-block flow (BFM,ACM,TI,ACT) and proposed instructional first flow (BFM, ACM, TI) by splitting the ACT phase execution as follows:

<u>Block 1</u>: BFM 1-5,ACM-1,TI 1-4, **ACT 1 and 3**

<u>Block 3</u>: **ACT 2, 4 and 5**, WPN 1-6 , FP1, ME 1-3

This ACT mission flow provides students with an IP demo on four-ship, air-to-air employment (ACT-1), followed by a student led mission (ACT-3) using the same scenario (VID vs. BVR) after the TI phase, preserving the existing building-block progression. Next, before Weapons, students accomplish ACT-2, 4, and 5 providing a

logical air-to-air scenario building-block flow for upcoming Weapons missions (VID vs. BVR, and PID vs. BVR). This compromise allows for student-led, four-ship, air-to-air missions after TI, finishing off the building-block design, while establishing and maintaining four-ship air-to-air flying proficiency and continuity before the Weapons phase. This potential solution would add two additional missions into Instructional Block 1 altering its training day requirement and would alter the academic course load and distribution requirements as well. This altered flying mission flow is offered as a conceptual solution and would require in-depth analysis for application and feasibility. The recommended solution to this problem is to alter syllabus content creating student-led, four-ship opportunities sooner (TI phase recommended). Within this proposal IPs must continue to observe student flight leadership, decision making, instruction, and execution based on IP-led, four-ship or student-led, two-ship missions until the later scheduled ACT phase.

Supporting Question 3: Does executing all F-16 night employment missions in a single night phase instructional block increase student learning?

Instructional Block 2 (F-16 night employment) was shown to have significant potential for increasing student learning. Specifically, research revealed that 77 percent and 72 percent of IPs surveyed agree that the proposed night block will increase student learning and retention of night employment skills respectively, over the current syllabus. The 94 percent also agreed the proposed night block maximizes night-flying event continuity compared to the current syllabus. Survey data also revealed that 94 percent of the IPs agreed that preserving IP and student circadian rhythm will improve their

performance, with 84 percent in agreement that the proposed night block does better preserve their circadian rhythm compared with the current syllabus flow. Also of note is that 100 percent of the IPs surveyed agreed that preserving their circadian rhythm reduces night-flying operational risk.

Specific benefits to the night instructional block include:

1. Better night-flying event continuity
2. Increased night-flying proficiency
3. Increased NVG continuity
4. Standardized schedules for academics, briefs, mission times, debriefs, etc.
5. Eliminates competition between instructing day and night F-16 employment skills at the same time
6. Better preserves IP and student circadian rhythms
7. Reduces operational risk associated with night flying

The benefits listed combined with the data collected from the research survey collectively demonstrate the capability for the proposed night block to increase student learning.

<u>Supporting Question 4</u>: Can altering the flow of F-16 academic syllabus courseware increase student learning and retention?

Data collected concerning the proposed academic syllabus flow clearly demonstrates its ability to increase student learning and retention of academic content. Specifically, survey data showed that 100 percent of IPs surveyed agree that applying academic material as soon as possible in its respective flying phase will maximize both student learning and retention. The 94 percent of the IPs surveyed agreed that the

proposed academic syllabus will increase both student learning and retention of academic material over the current academic syllabus.

The revised academic course flow does increase the course-load requirements in Instructional Block 1 compared to the existing course-flow. The additional course-load requirement can be offset by increasing academic instruction during the week, and having academics on weekends when necessary.

Benefits of the proposed academic syllabus include:

1. Reduced application delays of course material
2. Increased student learning and retention through timely application of subject matter
3. Improved academic course alignment with respective flying phases
4. Reduced remedial student instruction requirements

Primary Research Question: Can establishing a Phase-based "Instructional Framework" while optimizing the order in which the F-16 Division executes its flying and academic syllabi improve the instructional quality of the institution?

All of the previously mentioned data and specific benefits of the supporting questions demonstrate solid justification that the proposed syllabus design will improve the overall instructional quality of the WSF institution.

The combined effects of the instructional block framework, total building-block approach, and consolidated night employment set the conditions for maximized flying continuity, increased flying proficiency, and reduced student-based attrition. These benefits, added to the academic redesign advantages of improved application, better academic/flying-phase alignment and increased student learning and retention, combine

to produce an overall improvement in instructional quality for the USAF/WS F-16 Division.

## Recommendations

Careful analysis of the information, arguments, and data presented in the body of this proposal generated the following recommendations for WSF and the Weapons School:

1. USAF/WS Commandant and WSF Division Commander review proposed flying and academic syllabi for application and fit in future classes.
2. WSF application of proposed syllabus designs into a calendar mission-flow and academic course schedule for 12 student AIF and BIF calendar classes.
3. WSF implementation of proposed flying and academic syllabus in future WIC classes.
4. Remaining WS Division Commanders review proposal for conceptual use.

## Relationships to Previous Studies

The research conducted for this thesis provided data which supports both IDA research studies reviewed in chapter 2. Survey results are consistent with conclusions cited in the IDA papers *Relating Flying Hour Activity to the Performance of Aircrews* and *Flying Hours and Aircrew Performance.* Survey results show direct relationships between flying event continuity and student air-to-air proficiency. This study furthers these concepts by showing consensus among WSF IPs that the reduction of flying continuity causes reduced student proficiency, which in-turn, creates increased student-based attrition in the current WSF flying syllabus flow. The data collected also aligns

with findings in the 1993 USAARL paper *Activity/Rest Patterns of Instructor and Rated Student Pilots During Rapid Transitions from Daytime to Nighttime Duty Hours at the Eastern Army Aviation Training Site.* Instructors surveyed agreed that adjusting IP and student circadian rhythms, through longer duration night-go only flying schedules is desirable. As with the USAARL paper, the research for this study concluded that doing so will reduce student and IP fatigue, and reduce operational risk associated with night flying. Since the IP and student structure of the WS is identical to the structure used within the USAARL study, all findings concerning the differences between IPs' and students' abilities to adjust to rapidly shifting day/night schedules were verified.

## Suggestions for Further Research

Significant topics for further research resulting from the work conducted within this thesis include:

1. Impact of proposed WSF flying syllabus on FALCON maintenance operations
2. Design and implementation of a process for review and optimization of USAF flying and academic syllabus execution
3. Impact of USAF fighter aircraft day-night flying schedules on pilot fatigue, learning, and operational risk
4. Preservation of flying continuity and event proficiency in USAF flying syllabi

## Summary

The research conducted for this thesis revealed strong justification for the implementation of the proposed WSF flying and academic syllabus flow. The major changes within its design consist of: (1) aligning all current phases into an instructional block framework, (2) aligning all night employment missions into a single night-go only instructional block, (3) executing combat employment missions after all instructional missions, (4) preservation of perishable air-to-air flying proficiency, and (5) an optimized academic course flow. These changes combine to produce a revised syllabus flow which should increase student retention and learning of F-16 employment skills, better maintain student flying event continuity, increase student flying proficiency, reduce student-based attrition, and reduce operational risk. The academic revisions also should improve student retention and application of course material, and reduce remedial student instruction requirements. These alterations set the conditions needed to raise the students performance level to meet or exceed established course standards. In total, the research provided ample justification that the proposed flying and academic syllabus flow will improve the overall instructional quality of the F-16 Division.

## ATTACHMENT A

## SURVEY

USAFWS/WSF SURVEY ON PROPOSED DIVISION FLYING AND ACADEMIC SYLLABUS FLOW for Master of Military Art and Science Thesis

POC: Maj Chris "Wedge" Weggeman, USACGSC student, Ft. Leavenworth KS

The purpose of this survey is to evaluate a new proposed Flying and Academic syllabus *flow* for the F-16 Division. Attached you will find the current F-16 Division flying and academic syllabus flow and the respective new syllabi proposals. When completing this survey evaluate the new syllabus *solely* on its ability to answer the Thesis primary and supporting questions. Other considerations such as airspace availability, Mx issues, phase flow, student PFT, etc., must be left out. Assumptions relevant to this survey are listed with the syllabi.. The premise for the new Syllabus flow and survey questions lies within the following Thesis questions.

*Primary Question*: Can establishing a phase-based "Instructional framework" while changing the order in which the F-16 division executes its flying and academic syllabi improve the instructional quality of the institution?

*Supporting Questions*:

1. Does changing the phase flow/Framework create greater learning opportunities for the student?

2. Can altering Phase flow reduce attrition and preserve continuity in perishable F-16 employment skills?

3. Does executing all F-16 night employment missions in a single Night Phase "Instructional Block" increase student learning?

4. Can altering the flow of F-16 academic syllabus courseware increase student learning and retention?

**Definitions:**

Instructional Block: A course of training focused on teaching the instruction and execution of a set of specific employment skills in the F-16. Traditional flying Phases executed within the Instructional Block framework. Mission briefings are either "Instructional" (instruction provided throughout to facilitate mission accomplishment) or "Go to War" (briefing covers mission execution and contingency specifics only). Mission planning, debrief and analysis are always instructional in format.

**Assumptions**: A 12-student class, MX configurations/execution not considered. Airspace availability not considered. Adversary support requirements not considered (most likely optimized however). New flying syllabus flow is executed within ACC approved 98 day training cycle for AIF and BIF classes.

# NEW PROPOSED F-16 DIVISION FLYING SYLLABUS FLOW:

Current Syllabus Flow:

| Mission | Phase |
|---|---|
| BFM-1 | BFM |
| BFM-2 | |
| BFM-3 | |
| BFM-4 | |
| BFM-5 | |
| BFM-6 | |
| ACM-1 | ACM |
| TI-1 | TI |
| TI-2 | |
| TI-3 | |
| TI-4 | |
| TI-5 *NIGHT* | |
| ACT-1 | ACT |
| ACT-2 | |
| ACT-3 | |
| ACT-4 | |
| ACT-5 | |
| AAWE-1 | AAWE |
| AAWE-2 | |
| SA-1 | SA |
| SA-2 | |
| SA-3 | |
| SA-4 *NIGHT* | |
| SAT-1 | SAT |
| SAT-2 | |
| SAT-3 *NIGHT* | |
| CAS-1 | CAS |
| CAS-2 | |
| CAS-2A | |
| CAS-3 *NIGHT* | |
| CAS-3A *NIGHT* | |
| WPN-1 | Weapons |
| WPN-2 | |
| WPN-3 | |
| WPN-4 | |
| WPN-5CG NIGHT | |
| WPN-5CJ NIGHT | |
| WPN-6 | |
| FP-1CG | FP |
| FP-1CJ | |
| ME 1-3 | ME |

Proposed Syllabus Flow:

| Mission | Instructional Block |
|---|---|
| BFM-1 | Block 1:Ins F-16 Mission Fundamentals |
| BFM-2 | (Phases executed within) |
| BFM-3 | (Briefings: *Instructional*) |
| BFM-4 | |
| BFM-5 | |
| BFM-6 | |
| ACM-1 | |
| TI-1 | |
| TI-2 | |
| TI-3 | |
| TI-4 | |
| SA-1 | |
| SA-2 | |
| SA-3 | |
| SAT-1 | |
| SAT-2 | |
| CAS-1 | |
| CAS-2 | |
| CAS-2A | |
| AAWE-1 | AAWE |
| AAWE-2 | |
| TI-5 | Block-2: Instruction of F-16 Night Employment |
| SA-4 | (building block approach within) |
| SAT-3 | (Briefings: *Instructional*) |
| CAS-3 | |
| CAS-3A | |
| ACT-1 | Block-3: Instruction of F-16 Combat Mission Execution |
| ACT-2 | (Briefings: *Go to War*) |
| ACT-3 | |
| ACT-4 | |
| ACT-5 | |
| WPN-1 | |
| WPN-2 | |
| WPN-3 | |
| WPN-4 | |
| WPN-5CG *NIGHT* | |
| WPN-5CJ *NIGHT* | |
| WPN-6 | |
| FP-1CG | |
| FP-1CJ | |
| ME 1-3 | |

PROPOSED NEW ACADEMIC SYLLABUS FLOW:

| Current Phase flow | Current Course Flow | New Flying Phase flow | New Academic Flow |
|---|---|---|---|
| CORE I | CORE Courses, F-16 Radar | CORE I | CORE Courses, F-16 Radar |
| BFM | BFM, AIM-9, AIM-120 Gun, RWR/ECM/ALE | BFM | BFM, AIM-9, AIM-120 Gun, RWR/ECM/ALE |
| ACM | -ACM<br>-TI | ACM | -ACM<br>-TI<br>-4-Ship A/A employ. |
| TI | Thrx A/C, AAA, SAMs<br>-LANTIRN<br>-DCA<br>-Night A-A<br>-4-Ship A/A employ.<br>-OCA<br>-F-16 Conv. WPN T.O. and Attack Computation<br>-Maverick<br>-Maverick Interface and employment. | TI | Thrx A/C, AAA, SAMs<br>-LANTIRN<br>-F-16 Comp. Weapon delivery theory<br>-Maverick<br>-Maverick Interface and employment<br>-LGB basics<br>-PW I, II,III<br>-HTS/HARM interface<br>-F-16 Conv. WPN T.O. and Attack comp. |
| ACT | -F-16 Computed weapons deliv. Theory<br>-LGB Basics<br>-PW I, II, III<br>-Suspension and Rel.<br>-GP Bombs & Fuses<br>-CBU Bomb & Fuses<br>-HTS/HARM interface | SA/SAT | -Suspension and Rel<br>-SAMP (5 Courses)<br>-GP Bombs & Fuses<br>-CBU Bombs & Fuses<br>-CAS<br>-FAC-A |
| | | CAS | -Night A-A<br>-NVG |
| AAWE | SAMP (5 Courses), A/R | AAWE | MAROPS, CSAR, A/R |
| SA/SAT | -CSAR<br>-CAS<br>-FAC-A | NIGHT PHASE | -OCA<br>-DCA<br>(Remaining AAMP) |
| CAS | MAROPS<br>JMEM<br>MSN/CC Consid. | ACT | -JMEM |
| WPN | None | WPN | None |
| CORE II | | CORE II | |
| ME | None | ME | None |

SURVEY QUESTIONS RESPONSES: (Circle one)
**SD**- Strongly Disagree **D**- Disagree **N**- Neutral **A**- Agree **SA**- Strongly Agree

1. Changing WSF flying syllabus flow is a valid means of increasing student learning and instruction.
**SD D N A SA**

2. The proposed "Instructional Blocks" provide a better focus of Student instruction during flying phase execution than existing phase flow.
**SD D N A SA**

3. The proposed Instructional Blocks provide WSF IP's with an improved format for providing instruction.

**SD D N A SA**

4. Accomplishing all "instructional missions" before executing any "Go to War" missions will increase student learning.
**SD D N A SA**

5. Changing F-16 flying syllabus flow can increase instructional quality.
**SD D N A SA**

6. Changing F-16 flying syllabus flow can reduce student based attrition.
**SD D N A SA**

7. The proposed flying syllabus flow will reduce student based attrition in Air-Ground employment.
**SD D N A SA**

8. The proposed flying syllabus flow will reduce student based attrition in Air-Air employment.
**SD D N A SA**

9. The proposed flying syllabus flow will reduce student based attrition in F-16 Night mission employment.
**SD D N A SA**

10. Reduced flying event continuity increases student based attrition.
**SD D N A SA**

11. Proposed flying syllabus flow has better flying event continuity than the current syllabus.
**SD D N A SA**

12. F-16 Air to Air employment skills are the most perishable student skill.
**SD D N A SA**

13. The proposed F-16 flying syllabus flow better preserves F-16 Air to Air continuity than the current syllabus.
SD D N A SA

14. Executing all F-16 night missions in a single Instructional Block maximizes night flying event continuity.
SD D N A SA

15. Focusing instruction solely on F-16 night mission employment (proposed syllabus) vs. executing day and night missions together (current syllabus) will increase student learning of F-16 night mission employment skills.
SD D N A SA

16. Focusing instruction solely on F-16 night mission employment (proposed syllabus) vs. executing day and night missions together (current syllabus) will increase student retention
of F-16 night mission employment skills.
SD D N A SA

17. Proposed Flying syllabus flow will provide greater student learning of F-16 Night employment skills than current flying syllabus.
SD D N A SA

18. Executing a Night go only schedule increases WSF scheduling flexibility.
SD D N A SA

19. Preserving student/instructor circadian rhythm increases pilot performance.
SD D N A SA

20. Preserving student/instructor circadian rhythm reduces Division operational risk.
SD D N A SA

21. The proposed F-16 Night employment Instructional Block better preserves student/instructor circadian rhythm than the current syllabus F-16 Night mission flow.
SD D N A SA

22. The proposed F-16 flying syllabus flow will increase student learning and retention over the current syllabus.
SD D N A SA

23. Current F-16 academic courses are adequately aligned with their respective Flying phases.
SD D N A SA

24. Current F-16 Academic syllabus subject matter is always relevant to the current Flying Phase / Execution.
SD D N A SA

25. Applying academic instruction as soon as possible in its respective flying syllabus phase maximizes student learning of academic material.

**SD D N A SA**

26. Applying academic instruction as soon as possible in its respective flying syllabus phase maximizes student retention of academic material.

**SD D N A SA**

27. The proposed academic syllabus flow will increase student learning compared to the current academic syllabus flow.

**SD D N A SA**

28. The proposed academic syllabus flow will increase student retention of learning compared to the current academic syllabus flow.

**SD D N A SA**

ATTACHMENT B

SURVEY RESULTS

WSF SURVEY PERCENTAGES

*** = Total percentage of responses in "agreement" with idea

| QUESTION | SD | D | A | SA | *** |
|---|---|---|---|---|---|
| Supporting concepts | | | | | |
| 1 Changing flow valid for increase learn and instruction | 0 | 22 | 50 | 28 | 78 |
| 5 Changing flying flow can incr. Instructi quality | 0 | 0 | 78 | 22 | 100 |
| 6 Changing flying flow can reduce student based attrition | 0 | 22 | 67 | 11 | 78 |
| 12 A/A employment skills most perishable | 0 | 5 | 22 | 72 | 94 |
| 22 Proposed syllabus flow improve learning and retention over old | 0 | 38 | 39 | 23 | 61 |
| Instructional Block Framework | | | | | |
| 2 Instructional blocks provide more focused instruction than phases | 0 | 28 | 50 | 22 | 72 |
| 3 Instr. Blocks provide IP's improved format for instructing | 0 | 28 | 61 | 11 | 72 |
| 4 Doing all Instructional before "go to war" increas. Stud learning | 0 | 28 | 22 | 50 | 72 |
| Student Based Attrition | | | | | |
| 7 proposed fly flow reduces air to ground attrition | 0 | 55 | 39 | 6 | 44 |
| 8 reduces air to air attrition | 0 | 22 | 56 | 22 | 78 |
| 9 reduces night mission attrition | 0 | 50 | 26 | 24 | 50 |
| 11 proposed has better flying event continuity | 0 | 28 | 44 | 28 | 72 |
| 13 better air to air event continuity | 0 | 28 | 33 | 39 | 72 |
| Night Phase flow | | | | | |
| 14 Execut. All night msn in single block max. night event continuit. | 0 | 6 | 61 | 33 | 94 |
| 15 New syllabus increases stud. Learning on Night employ. over old | 0 | 23 | 50 | 27 | 77 |
| 16 New Syllabus increases stud. Retention of Night employ over old | 0 | 28 | 50 | 22 | 72 |
| 17 New Syllabue provides greater learning of night skills than old | 0 | 33 | 44 | 23 | 67 |
| 18 Night go only schedule increases scheduling flexibility | 0 | 22 | 56 | 22 | 78 |
| 19 preserving circadian rhythm increases pilot performance | 0 | 6 | 50 | 44 | 94 |
| 20 preserving circadian rhythm reduces operational risk | 0 | 0 | 56 | 44 | 100 |
| 21 New night block better preserves CR over old night flow | 0 | 17 | 56 | 28 | 84 |
| New Academic flow | | | | | |
| 23 current academic courses adequately aligned with flying | 6 | 54 | 44 | 0 | 44 |
| 24 current subject matter always relevant to current flying phase | 6 | 64 | 27 | 6 | 67 |
| 25 applying academ. Instruc. ASAP in flying max. student learning | 0 | 0 | 67 | 33 | 100 |
| 26 applying academ. Instruc. ASAP in flying max. student retention | 0 | 0 | 62 | 38 | 100 |
| 27 proposed academ. Flow will increase stud. Learning over old | 0 | 5 | 67 | 28 | 95 |
| 28 proposed academ. Flow will increase stud. retention over old | 0 | 5 | 67 | 28 | 95 |

## REFERENCES


Brenner, Richard L. 1990. *Night Training: A Better Way.* Alabama: Air War College, Air University.

Comperatore, Chlaramonte, Jacquelyn Y. Pearson, Lewis W. Stone, Gerald L. Hess, and Kenneth O. Boley. 1993. *Activity/Rest Patterns of Instructor and Rated Student Pilots During Rapid Transitions From Daytime to Nighttime Duty Hours an the Eastern Army Aviation Training Site.* Alabama : United States Army Aeromedical Research Laboratory. USAARL Report 93-16.

Fantini, Michael, Major, USAF, and Major David Lujan, USAF. 1998. "98BIF Academic Course Schedule." Nellis AFB, Nevada.

Guastella, Joseph, Major, USAF, WSF Instructor Pilot. 1998. Telephonic interview by author, 12 November, Leavenworth, KS.

Guastella, Joseph, Major, USAF.
1997. "97AIF CAS Phase Hotwash." Nellis AFB, Nevada.
"97BIF CAS Phase Hotwash." Nellis AFB, Nevada.

1998. "98AIF CAS Phase Hotwash." Nellis AFB, Nevada.

Hammon, Colin, and Stanley Horowitz. 1990. *Flying Hours and Aircrew Performance.* Virginia: Institute for Defense Analysis. IDA Paper P-2379.

Hammon, Colin, Stanley Horowitz, and Paul R. Palmer. 1987. *Relating Flying-Hour Activity To The Performance of Aircrews.* Virginia: Institute for Defense Analysis. IDA Paper P-2085.

Hardin, Craig, Captain, USAF.
1995. "95A Weapons Phase Hotwash." Nellis AFB, Nevada.
"95B Weapons Phase Hotwash." Nellis AFB, Nevada.

1996. "96A Weapons Phase Hotwash." Nellis AFB, Nevada.

Meyer, David, Captain, USAF.
1997. "97A ACT Phase Hotwash." Nellis AFB, Nevada
"97B ACT Phase Hotwash." Nellis AFB, Nevada.
"97A ACT Phase Hotwash." Nellis AFB, Nevada.

Moore, Mark D., Major, USAF. WSF Operations Officer, 1998. Telephonic interview by author, 12 November, Leavenworth, KS.

Pone, Adrian, Captain, USAF.
1997. "97A TI Phase Hotwash." Nellis AFB, Nevada.
"97B TI Phase Hotwash." Nellis AFB, Nevada.

1998. "98A TI Phase Hotwash." Nellis AFB, Nevada.

Semmel, Greg, Captain, USAF.
1995. "95B TI Phase Hotwash," Nellis AFB, Nevada.

1996. "96A ACT Phase Hotwash," Nellis AFB, Nevada.
"96B ACT Phase Hotwash," Nellis AFB, Nevada
"96A TI Phase Hotwash," Nellis AFB, Nevada.
"96B TI Phase Hotwash," Nellis AFB, Nevada.

Thirtyacre, David, Major, USAF. WSF Instructor Pilot. 1998. Telephonic interview by author, 12 November, Leavenworth.

Thirtyacre, David, Major ,USAF.
1997. "97BIF SA/SAT Phase Hotwash," Nellis AFB, Nevada.

1998. "98 AIF SA/SAT Phase Hotwash," Nellis AFB, Nevada.

USAF Weapons School Instructor Course F-16. July 1997. ACC Syllabus course No, F-1600ID0PN: *USAF Weapons School Instructor Course, F-16*. Department of the Air Force.

Vanderveer, Garry, Captain, USAF.1997. "97BIF Calendar Phase Flow," Nellis AFB, Nevada.

Williams, Robert D. 1990. *A Wing Commander's Guide to Night Flying.* Alabama: Air University. Air War College.

Weggeman, Chris P., Major, USAF.
1996. "96B Weapons Phase Hotwash," Nellis AFB, Nevada.

1997. "97A Weapons Phase Hotwash," Nellis AFB, Nevada.
"97B Weapons Phase Hotwash," Nellis AFB, Nevada.

INITIAL DISTRIBUTION LIST

1. Combined Arms Research Library
   U.S. Army Command and General Staff College
   250 Gibbon Ave.
   Fort Leavenworth, KS 66027-2314

2. Defense Technical Information Center/OCA
   8725 John J. Kingman Rd., Suite 944
   Fort Belvoir, VA 22060-6218

3. Air University Library
   Maxwell Air Force Base
   AL 36112

4. Lt. Col. Craig Franklin
   USAFWS/WSF
   4269 Tyndall Ave.
   Nellis Air Force Base
   NV 89191-6074

5. Maj. Ken Rossen
   BCTP
   USACGSC
   1 Reynolds Ave.
   Fort Leavenworth, KS 66027-1352

6. Lt. Col. Chan Floyd
   Air Force Element
   USACGSC
   1 Reynolds Ave.
   Fort Leavenworth, KS 66027-1352

CERTIFICATION FOR MMAS DISTRIBUTION STATEMENT

1. Certification Date: 4 June 1999

2. Thesis Author: Major Christopher P. Weggeman

3. Thesis Title: USAF Weapons School, F-16 Division Revised Flying and Academic Syllabus Flow

4. Thesis Committee Members

Signatures: Charles [illegible]
David W. Van [illegible]

5. Distribution Statement: See distribution statements A-X on reverse, then circle appropriate distribution statement letter code below:

A B C D E F X SEE EXPLANATION OF CODES ON REVERSE

If your thesis does not fit into any of the above categories or is classified, you must coordinate with the classified section at CARL.

6. Justification: Justification is required for any distribution other than described in Distribution Statement A. All or part of a thesis may justify distribution limitation. See limitation justification statements 1-10 on reverse, then list, below, the statement(s) that applies (apply) to your thesis and corresponding chapters/sections and pages. Follow sample format shown below:

EXAMPLE

| Limitation Justification Statement | / | Chapter/Section | / | Page(s) |
|---|---|---|---|---|
| Direct Military Support (10) | / | Chapter 3 | / | 12 |
| Critical Technology (3) | / | Section 4 | / | 31 |
| Administrative Operational Use (7) | / | Chapter 2 | / | 13-32 |

Fill in limitation justification for your thesis below:

| Limitation Justification Statement | / | Chapter/Section | / | Page(s) |
|---|---|---|---|---|
| | / | | / | |
| | / | | / | |
| | / | | / | |
| | / | | / | |
| | / | | / | |

7. MMAS Thesis Author's Signature: Chris P. Wegg[illegible]

STATEMENT A: Approved for public release; distribution is unlimited. (Documents with this statement may be made available or sold to the general public and foreign nationals).

STATEMENT B: Distribution authorized to U.S. Government agencies only (insert reason and date ON REVERSE OF THIS FORM). Currently used reasons for imposing this statement include the following:

1. Foreign Government Information. Protection of foreign information.

2. Proprietary Information. Protection of proprietary information not owned by the U.S. Government.

3. Critical Technology. Protection and control of critical technology including technical data with potential military application.

4. Test and Evaluation. Protection of test and evaluation of commercial production or military hardware.

5. Contractor Performance Evaluation. Protection of information involving contractor performance evaluation.

6. Premature Dissemination. Protection of information involving systems or hardware from premature dissemination.

7. Administrative/Operational Use. Protection of information restricted to official use or for administrative or operational purposes.

8. Software Documentation. Protection of software documentation - release only in accordance with the provisions of DoD Instruction 7930.2.

9. Specific Authority. Protection of information required by a specific authority.

10. Direct Military Support. To protect export-controlled technical data of such military significance that release for purposes other than direct support of DoD-approved activities may jeopardize a U.S. military advantage.

STATEMENT C: Distribution authorized to U.S. Government agencies and their contractors: (REASON AND DATE). Currently most used reasons are 1, 3, 7, 8, and 9 above.

STATEMENT D: Distribution authorized to DoD and U.S. DoD contractors only; (REASON AND DATE). Currently most reasons are 1, 3, 7, 8, and 9 above.

STATEMENT E: Distribution authorized to DoD only; (REASON AND DATE). Currently most used reasons are 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

STATEMENT F: Further dissemination only as directed by (controlling DoD office and date), or higher DoD authority. Used when the DoD originator determines that information is subject to special dissemination limitation specified by paragraph 4-505, DoD 5200.1-R.

STATEMENT X: Distribution authorized to U.S. Government agencies and private individuals of enterprises eligible to obtain export-controlled technical data in accordance with DoD Directive 5230.25; (date). Controlling DoD office is (insert).